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QUEENSLAND AGRICULTURAL JOURNAL.

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QUEENSLAND AGRICULTURAL JOURNAL

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Event and Comment.

Service—A Thought for the New Year.

ACKNOWLEDGING the welcome received by him at a recent Rotarian gathering in Brisbane, His Excellency the Governor, Sir John Goodwin, remarked that in the course of the preceding ten days he had visited twelve or thirteen schools and, without realising it, had been preaching Rotarian doctrines. He had tried to impress upon the children that their work did not end with their life at school; their duty to the State then really only commenced. One word that must be borne in mind was the word "Service." That word expressed practically everything that was required in a State like this. A comparatively young country, it could not make progress without service from everyone. Every man and woman must be prepared to give of his best. It was simply splendid to see the amount of work that was done in the way of service. Everywhere he went he saw people giving up time and energy, and, where they could afford it, money. It was all service for the community. He could not tell how gratified and delighted he was to see it. There was nothing more contemptible than idleness, and there was no person more despicable than the man who lived for himself alone—who never gave a second's thought to service for the community or for his country. In travelling through Queensland one saw the Rotary movement flourishing in many places. There were many other organisations giving similar service, and inculcating into the minds of the people the best principles and the highest ideals. The Rotary Club, Toc H, Boy Scouts, Girl Guides, and many other organisations were doing splendid work. He always considered that, with such ideals in view, Queensland, a young country with tremendous resources, must have a happy and prosperous future.

Soil Surveys.

FROM an agricultural point of view, one of the most important measures considered in the course of the Parliamentary Session just closed was the Soil Survey Bill, introduced by the Minister of Agriculture and Stock, Hon. Harry F. Walker, and passed through all its stages. The new measure gives the right of entry by authorised persons on to private lands within the State for the purpose of carrying on soil surveys. Provision is also made for the payment of compensation in certain circumstances for any damage that may be sustained by the land owner in the course of any survey; probably this is a new departure, but it was considered advisable by the Government. The onus of proof of any damage rests, of course, with either the owner or the occupier. The Bill, which is regarded as long overdue, is necessary not only for the purpose of investigating matters relating to plant life in agricultural areas, but for the purposes of stock research, particularly in pastoral districts. It is of the greatest importance, for instance, that the fullest possible knowledge should be obtained of the chemical and other characteristics of our natural grasses and edible shrubs, if we are to make the most of and do the best for our live stock industries. Our soil research work to date has been very limited, but the work that has been done has already proved of immense economic value, especially in some sugar districts where certain soil deficiencies demonstrated by survey and analysis were subsequently corrected with very satisfactory crop results. The main purpose of the new legislation is to make an inventory of Queensland soils, and this will be most valuable to the new settler and the man already on the land.

Tobacco Land in the North.

SPEAKING on the second reading of the Soil Survey Bill, the Minister in charge of it, Mr. Walker, referring to valuable investigations already made in the sugar and cotton belts, said that quite recently many analyses of Northern soils had been made with a view to ascertaining their suitability for tobacco growing. From the data obtained it could be shown that tobacco could be grown in North Queensland equal to that produced in any other portion of the Commonwealth. Other facts revealed by an effective soil survey, which had been necessarily limited territorially, added Mr. Walker, went to strengthen the case for the extension of tobacco growing in Queensland and, incidentally, showed what great benefits will follow a systematic soil study throughout the State.

The Cotton Industry.

PLANS for establishing the cotton industry more firmly in Queensland were announced by the Minister, Mr. Harry F. Walker, recently, and these include the active encouragement of the establishment of cotton manufactures within the State. In the course of his statement, Mr. Walker said that it was noteworthy that if the cotton manufacturing industries throughout the Commonwealth were developed to an extent comparable with Canada, and having regard to the difference in population, we would be growing and manufacturing in Australia close upon 200,000 bales of cotton, worth £10,000,000 per annum, whereas last year's production was 5,000 bales, worth only a few thousand pounds sterling. It was considered that a sixfold increase of production in Queensland would be attainable within a short term of years on existing lands with a continuous progressive increase. The average yield per acre in Queensland was slightly in excess of the average yield per acre in the United States, while the quality of Queensland cotton was, on the average, at least 100 points above American middling.

When a commencement was made upon the establishment of the industry at the beginning of the decade just ended, it was thought that the industry would be engaged in only as a side line by mixed farmers on small acreages. While this might probably always be so to some extent, the experience of the past three years had led to the view that specialising in the production of cotton seemed to be more profitable to the farmer, and more economical in production cost than the engaging in it as a side line with other crops. The most successful cotton growers were those who had concentrated on the growing of cotton on large acreages.

With respect to marketing, the chief item of cost in Queensland has been that of ginning, which was at least double that ruling in America. Plans for the cheapening of ginning costs for Queensland growers had been formulated. The taking of action had been suspended, pending a determination by the Commonwealth authorities respecting the duties, and now that the Commonwealth policy had been announced the matter would be brought to a head. The question of the establishment of co-operative ginneries also was about to be considered, as well as other matters relating to the stabilisation and further development of cotton growing and manufacture within the State.

Committee of Direction of Fruit Marketing.

EMPHATIC endorsement of the principle of co-operative selling has been given by the fruitgrowers of Queensland. On being asked to decide by postal ballot whether the operation of the Fruit Marketing Organisation Act, and therefore of the Committee of Direction, should be continued for a further five years, they recorded an overwhelming affirmative vote. Expressing his satisfaction at the result, the Minister, Mr. Walker, said that organised marketing was the only system under which farmers could successfully compete in, or against, the commercial world. The actual figures were—For continuance, 3,240; against, 476; informal, 32; majority for continuance, 2,764. As only a simple majority was required to give effect to the proposal, the Act will continue in operation. Altogether 5,332 ballot-papers were issued to fruitgrowers all over the State, and 3,748 were returned. This constituted a 70 per cent. poll, of which 87 per cent. was in the affirmative.

Dairying—The Best Season for Years.

DISCUSSING conditions in the dairying industry, the Under Secretary, Mr. Graham, says in his Annual Report that it is pleasing to record that the dairying industry had the best season for years. In the dairying areas conditions were generally favourable for high production. Early spring rains ensured good pasturage until the beginning of the wet season in mid summer. With grass and fodder in ample supply there was no evidence of the usual decline of output in the autumn.

Butter production for the year reached the highest point yet recorded in Queensland, being nearly 5,000,000 lb. above the record for the previous peak period. This gratifying position is due very largely to a general improvement in dairy practice and factory processes. The modernisation of manufacturing plants was also a factor in this advance.

The past year was remarkable for the number of new factories that were built to replace old and obsolete plants and to meet the rapidly expanding requirements of the industry. In the Upper Burnett dairying developed to such an extent in the newly settled territory that a factory had to be built to cope with the heavy cream output. In all these establishments modern manufacturing units have been installed.

In the State there are now fifty-two butter factories, seventy-three cheese factories, and one condensed milk factory in operation. These are supplied from 22,500 dairy farms, which include those supplying, wholly or partially, the domestic milk market. The capital invested in the industry in Queensland approximates £35,000,000. The value of the output for the period under review was approximately £7,600,000.

There is still room for improvement, however, in the quality of cream. The general use of motor transport has provided for regular and quicker cream deliveries; but it has also helped to increase competition among manufacturers who by this means are able to draw supplies from localities far beyond the limits of their natural territorial zones. This bidding for cream often tends to encourage laxity in methods of production and other forms of inefficiency which the Department seeks assiduously to correct. As stressed in previous reports, unregulated cream cartage is wasteful and generally unsatisfactory; an efficient transport organisation is an essential service to the modern butter factory.

Systematic instruction in the science and practice of dairying and regular inspection of dairies, which covered also the inculcation of hygienic principles when necessary, engaged the attention of the field staff in the course of the year.

There was a general improvement in manufacturing methods, and this cause for satisfaction is due largely to the employment of technically trained and qualified staffs. There are, however, some practices in regard to cream grading and some technical faults in manufacture that call for consideration and correction if we are to increase the quantity of best-quality butter and attain and maintain generally the highest standards of dairy production. The total quantity of butter manufactured for the year was 74,386,663 lb., which constitutes a record for the State.

The value of systematic herd testing is now recognised more widely, and it is satisfactory to report the cordial co-operation of an ever-increasing number of dairy farmers with officers of the Department.

It is also recognised more generally that the provision of fodder reserves and improvement of pastures are essential to increased and regular production. Too much dependence on natural grasses and herbage without any supplementary rations exposes the industry to undue seasonal risks, as well as to economic loss due to irregularity of supply.

Photo.: H. W. Mobsby, F.R.A.S.]

PLATE 1.

In the shade of Bartle Frere, the loftiest mountain in Queensland, nestles the flourishing town of Babinda, the centre of one of the richest regions on our far north coast, one of the most fertile provinces in the whole world. In the left centre is a beautiful bend of Babinda Creek, a tributary of the Russell River, bordered by well-tilled canefields, land that was formerly clothed luxuriantly in dense tropical jungle.

The Minister's New Year Message

To the Farmers of Queensland.

Department of Agriculture and Stock,
Brisbane, 31st December, 1929.

Optimism is an Australian characteristic, and why not! Though many new and perplexing problems confronted us during recent years, we have in a measure succeeded in settling some of them, while in respect to others of greater complexity we have advanced well along the road to their ultimate solution. With regard to many of them we have fortunately been able to erase old lines of cleavage, and to give of our best in healthy co-operation for the common good.

In respect of primary industry particularly, we are already bringing the advantages of scientific research to bear on questions of production, and are also applying them more widely in the field of distribution. Reduction of costs, the elimination of waste and the full utilisation of all our resources are regarded by most of us as essentials in the improvement of our economic life. We are coming to a better understanding of all these needs and, in the spirit of sweet reasonableness, we are rising above old and outworn distinctions. We are looking for the whole hearted co-operation of all concerned in doing the work of the country in all those things that call for vigorous and understanding effort along lines that will lead to social happiness and material prosperity.

Looking around on the world to-day and, notwithstanding all our present difficulties, which we do not discount and will not exaggerate, I know of no people more happily placed in a country more abundantly blessed.

At the beginning of another year and at the dawn of a new decade, with rapid and sound development in our primary industries; a corresponding expansion in our secondary enterprises and consequent extension of our home markets; and a deepening public appreciation of the call for social service we may look forward cheerfully and confidently to an early realisation of further benefits, added to those we now enjoy and which have given rise to the feeling of optimism that I have expressed.

I wish the producers of Queensland good seasons and good markets in the coming year and the years that are to follow; that prosperity will be brought to their homes and happiness to their families and that success will continue with them through a long and fruitful future.

Harry F. Walker

Secretary for Agriculture and Stock.

Bureau of Sugar Experiment Stations.

CANE PESTS AND DISEASES.

The following report (7th December, 1929) from Mr. W. A. MacDougall, Assistant to the Entomologist at Meringa, has been received by the Director of the Bureau of Sugar Experiment Stations, Mr. H. T. Easterby:—

Short trips were made to mill areas—Babinda (12th and 13th November); Tully (14th and 15th November); and Goondi (21st November).

The Beetle Borer *(Rhabdocnemis obscurus* Boisd.).

The infestation at Tully is negligible. The very little present could not be eradicated by Tachinid flies; it would not support the parasites.

As previously reported (17th October, 1929), the Goondi area is under systematic control. A further sixty flies were liberated in borer-infested Badila on river flats across the river from Goondi Mill.

It was pointed out that a borer infested banana plants also. The insects taken from the banana corms were the banana borer (*Cosmopolites sordida* Chev.), which species has never been found in cane sticks.

Trucks of cane in the Babinda mill yard were inspected for borer damage. About 10 per cent. of the cane in the yard, at the time of inspection, showed the presence of borer on the farms on which it had been cut. Unfortunately, it was found that these farms hadn't standover; therefore Tachinid flies cannot be liberated on them at present. During the past four years numerous liberations have been made on one farm in this area. In the localities close to the liberations the borer damage is comparatively lighter than that of a few years ago. In one block 300 yards from any liberations, 5-feet Badila sticks were found to have been completely riddled by borers. In some other instances the damage was at the top only or was confined to the lower 1 or 2 feet. Twenty of the heavily infested sticks were cut open and examined. An average of ten grubs and cocoons per stick was estimated. Of these one to two per stick had been killed by flies (an average of three puparia to an infested grub). The farmer in question plants, as far as possible, "clean" seed. To help the flies with such heavy work, traps of split cane should be spread, particularly during March and April. These traps, placed amongst the seedlings at the Experiment Station, South Johnstone, have been the means of catching hundreds of adult borers.

Emergence of Beetles (*L. caudata* Blkb.).

At Babinda, 89 points of rain fell during the last week in August. This liberated *Lepidiota caudata* Blkb. There were a few strays about during the last few days of August, but the big flight was during the first week of September. From reports, the adult habits seem to be similar to those of adults of *L. frenchi* Blkb. The last of these beetles (*L. caudata* Blkb.) was seen on 8th October.

At Tully, near swampy land, there were numerous *Anoplognathus smaragdina* Ohaus, resting on *Acacia* sp. The grubs of this beetle have never been recorded as attacking cane.

At Goondi, small patches of Pompey and Badila have been checked by grubs of *Anoplognathus boisduvali* Boisd. (Christmas Beetle). The damage was not extensive, and probably the existing weather conditions were responsible for the showing up of damage which, under more moist conditions, would not have been noticeable. Again, under normal conditions, it is very probable that these grubs would not attack cane at all. After over an inch of rain the "greybacks" were flying in Goondi area on the 19th instant. Previous to this numerous "strays" had been picked up dead.

Army Worms and Moth Borers.

As usual there were outbreaks of army worms at Harvey's Creek and Bartle Frere. The damaged cane has recovered. The spraying, with lead arsenate, of the cane immediately in front of an advance of these caterpillars on a farm at Tully was successful in its purpose. The advance was checked.

On examination of the few "dead-hearts" found around Mirriwinni it was found that the moths had emerged.

At Tully, some "dirty," flooded H.Q. 426 was found to be badly infested by the large moth borer (*Phragmatiphila truncata* Walk.). The cane was anything up to 3 feet long, but had been attacked anywhere along its length. Plants could not be cut from it as it would be practically impossible to get them "clean."

Minor Pests.

One patch of young cane, at Tully, was being attacked by nymphs of a grasshopper (unidentified). These nymphs attacked "blady" grass also. A species of bag-moth (*psychidæ*) and an *Atractomorpha* sp. were noticed feeding on cane leaves. At Mirriwinni, *Aphidæ* (plant lice) were plentiful, and occasionally every leaf of a young plant would be infested.

Along the headlands or in the nearby scrub, the following insects, amongst others, were taken:—*Amenia imperialis* R.D. (Dexiid fly), *Acsernia australica* Jac. (leaf-eating beetle), *Theogonis australis* Fabr. (Coreid bug), and a series of *Stephanitis queenslandensis* Hacker (Tingitidæ).

Thanks are due to the field officers at Goondi and Tully mills for help given and information supplied.

ENTOMOLOGIST'S ADVICE TO CANEGROWERS.

Apparatus for Fumigating Cane Grubs.

During the last twelve months a decided advance has been made in the construction of mechanical apparatus for treating grub-infested cane land. The importance of such mode of application was first stressed by the present writer in the year 1924, when several attempts were made to induce the firm of Massey-Harris to build a suitable machine, or adapt one of their corn-planters for such useful work (see Bull. No. 19 of this Office, pp. 19, 20).

A few years later (1926) I discussed this matter with Messrs. Gelling Brothers, of Cairns, and persuaded them to undertake the construction; with the result that they have just succeeded in completing a machine for injecting liquid fumigants, which will, I understand, be used this coming season by some of our canegrowers.

There is still room for some farmer of an inventive turn of mind to hit upon some simple method of applying dry paradichlor. to grub-infested cane land; either by constructing a machine for burying uniform doses of this fumigant alongside the cane rows, or by adapting some fertilising machine for such purpose. It is probable that during the coming season two machines, at least, for applying liquid injections will be tried out in our canefields.

Examine the Soil for Grubs of Greyback Cockchafer.

In localities where a few inches of rain chanced to fall early in November, grubs of this pest will be found to be in the first instar or condition of development. This stage, which covers the time from hatching of the eggs to the first moult or change of skin, lasts from four to five weeks, and may be at once distinguished by a glance at the head, which never exceeds one-eighth of an inch in width.

This simple character, together with the presence on the middle of the lower surface of the last body segment of the grub, of two parallel rows of tiny bristles (easily seen with a pocket lens), indicates that the grub in question is that of our common "greyback" cockchafer.

Farmers Take Notice.

Growers seeking advice or applying for the liberation of tachinid parasites to be made amongst borer-infested cane, are asked to forward at the same time a sample of the insect believed to be causing the damage.

Moth-borer injury is frequently mistaken for that brought about by the "weevil borer" (*Rhabdocnemis obscurus* Boisd.) since both of these insects are found tunnelling in cane sticks. No less than six different insects attack shoots of young ratoon and plant cane, all of which are responsible for damage of very similar appearance—viz., death of the central or heart-leaves, known commonly as "dead-hearts."

When uncertain as to the name or habits of any insect discovered to be injuring cane (whether the roots, sticks, or leaves) the specimen should be dropped into a small bottle containing methylated spirits and water (half and half), and posted at once to the Entomologist at Meringa Experiment Station for identification and advice.

THE QUEENSLAND SUGAR INDUSTRY.

By H. T. EASTERBY, Director, Bureau of Sugar Experiment Stations.

IN the following series of articles it is proposed to revise and bring up to date a Bulletin on the Sugar Industry, prepared by the writer some years ago. During the period that has elapsed the industry has developed to such a degree and the conditions have so altered that such a revision appears necessary. At the same time, it is recognised that the problem of the sugar industry in Queensland, which supplies some 96 per cent. of Australian-grown sugar, is so many-sided and is governed by so many factors, that it forms in itself a complicated study of no mean magnitude, and one which it is impossible to deal with completely in much less than a large volume. The industry has also during late years been closely bound up with politics, both Federal and State.

It is proposed to divide the subject under several heads, each of which will be dealt with as briefly as possible. These will include—

PART I.

(*a*) Short history of the Queensland sugar industry prior to federation.

(*b*) Review of the industry since federation.

(*c*) Scientific work, varieties of cane, cultivation, soils, pests, milling work.

(*d*) Comparison with other countries.

(*e*) Labour and wages.

(*f*) Health in the tropics.

(*g*) Utilisation of by-products.

(*h*) Present-day problems. Foreign settlement.

(*i*) National importance of the industry and need for protection.

(*j*) Expansion of the industry.

(a) Short History of the Industry Prior to Federation.

The cane-sugar industry in Queensland, like many others, commenced on an insignificant scale early in the history of the then colony.

It was stated in a report on the sugar industry made in 1880 by Mr. Henry Ling Roth, to whom I am indebted for many of the following details, that as far back as 1823 Mr. Thomas Scott, under the patronage of Sir Thomas Brisbane, succeeded in growing sugar-cane at Port Macquarie, in New South Wales, and manufacturing 70 tons of sugar. Mr. Scott worked hard, both practically and by ventilation of the subject in local newspapers, to prove that sugar could be manufactured in that colony. In 1849, proposals were made for the formation of a sugar company in South Brisbane, and there is said to have been a small plantation at Eagle Farm, on the Brisbane River, but apparently no sugar was made. Sugar-cane was cultivated in the gardens of several people in Brisbane about this time, and a considerable amount was also grown in the Government Botanic Gardens, for it has been stated that a patch of land was devoted to its cultivation; and here apparently the first definite effort was made to manufacture sugar in Queensland. This occurred at any rate some years before 1860; and if one may accept the evidence given by Mr. George Edmondstone, M.L.A., before a Select

Committee of the Legislative Assembly, the attempt was made by Thomas Bowden, "who was introduced by Dr. Lang for the purpose of commencing sugar-cane growing and manufacture of sugar, but he was not successful in the manufacture."

The first sugar produced in Queensland, according to Mr. Walter Hill, at one time in charge of the Botanic Gardens, Brisbane, was made as follows:—Sugar-cane was taken from the Botanic Gardens in December, 1859, and passed between two steel rollers. The juice was taken to Mr. Brooks's biscuit factory in Queen street, and about 6 lb. of sugar was made in a copper vessel. Others say this sugar was made at Mr. Fowles's bakery, next the Australian Hotel, in Queen street. In 1861, sugar-cane was exhibited at the first Queensland Exhibition, also a good quality of rum manufactured from same. The first sugar made in Queensland, however, of which there is any official record, was manufactured by Mr. John Buhot in 1862, and a committee consisting of Messrs. S. W. Griffith, Moreton, Buzacott, and Macrossan was subsequently appointed to inquire into certain claims made by Mr. Buhot. Its report was published in 1874; and from the report and the proceedings of the committee we get at any rate something definite. The committee found—

(*a*) That Mr. Buhot was the first person who actually made granulated sugar in Queensland from sugar-cane grown in the colony.

(*b*) That before 1862 (when Buhot succeeded in making such sugar) many persons had contemplated the possibility of growing sugar-cane to profit in the colony, but it was not ascertained whether sugar could actually be produced from such cane; and a recommendation was made that a free grant of 500 acres of land be made to Mr. Buhot as a reward.

In 1863, Captain Louis Hope had 20 acres under cane on Ormiston plantation, near Brisbane, and that gentleman is generally conceded to be the father of the Queensland industry. In recognition of his services to the State in that respect an Act in the Queensland Parliament was passed in which it was stated—"Whereas it is just and expedient that the important services of the Honourable Louis Hope in his endeavours to establish the production of sugar should be recognised . . . ." and then proceeded to authorise the Hon. Louis Hope "to select in one or two portions, the whole not exceeding 2,560 acres of land . . . . within 30 miles of the coast . . . . and to obtain a grant in fee simple of such land."

In 1863 the London Society of Arts offered a medal for the first ton of sugar made in the colony. The first sugar-cane plants were most probably imported from Java and Mauritius, and about this time the Queensland Acclimatisation Society took active steps in bringing over a large number of varieties. A tremendous impetus was given to the industry when land was made available for some years by the Government on remarkably easy terms for sugar growing, and in 1865 as much as 1,829 acres had been taken up. Shipments of cane plants were this year made to New South Wales farmers. Many people embarked on sugar-growing, who had no knowledge of the subject, but possessed a vague confidence that it would come out all right, and some even commenced planting cane on the Darling Downs in the most unlikely localities.

The early stages of the industry were almost entirely devoted to the production of cane and the extension of land under cultivation. In 1866 so great was the demand for plants that there was actually a scarcity of cane for planting.

By the end of 1867 there were nearly 2,000 acres under cane, and six mills had been erected which between them manufactured 168 tons of sugar. There was. however, an insufficiency of mills, which caused heavy losses to the famers, but it is stated that millowners did well, as they could buy cane for 4s. a ton.

However, by 1870 there was twenty-eight mills in operation and a number of others in course of erection. The principal cane districts were then the Albert and Logan, the Moreton Bay area, the Mary and Wide Bay, but the cultivation of cane now began to spread to Bundaberg, Mackay, the Herbert and Johnstone Rivers, and Cairns. It is in these places to-day that almost the entire output is manufactured, the extreme southern districts making very little.

The Hon. T. H. Fitzgerald and John Spiller are credited with having planted the first cane in Mackay, and the first mill in that district (Alexandra) was erected by Fitzgerald and Davidson in 1868. Shortly afterwards, the following mills were erected, viz.:—Pleystowe, Branscombe, Nebia, Dumbleton, Pioneer, Foulden, and Casada. According to statistics at the time there were 3,436 acres under cane in the Mackay district in 1872.

Sugar-growing continued to prosper, more land was brought under cultivation, and steam mills quickly superseded the antiquated cattle and horse power erections.

The following description of the work of an early sugar mill by Major A. J. Boyd is interesting:—

> "In the early days of sugar-growing in Queensland there was no such thing as the modern sugar mill. One form of mill consisted of three upright rollers, about 2 ft. high and 15 or 18 in. in diameter. Some of these rollers were driven by four horses walking round a circular horse path and harnessed to each end of a beam to which one of the rollers was attached. The work was very heavy, and at least eight horses were required for relief. The "battery" consisted of two oblong pans into which the juice from the rollers was led. There it was clarified by liming on attaining a heat of about 140 deg. F. From these clarifiers the juice was led by pipes to two lower pans called subsiders. There the scum was removed by large perforated ladles, and then the juice went to the first pan (the green pan of the battery). There were four large square pans, and one circular one called 'the tache.' In the first four the juice was frequently skimmed while boiling, a roaring fire being maintained in the furnace beneath them. On arrival at the tache, the juice was bucketed into it, and it was boiled until it bubbled like porridge. At this stage a circular bucket with a valve at the bottom was lowered into the tache and conveyed the contents to the wooden coolers, where it was left to granulate. This process was repeated as fast as the tache was refilled from the pans. Should the sugar-boiler not be careful to note the appearance of the concentrated juice when boiling in the tache, the result would be that instead of granulating, in the coolers, a sticky slimy mass would be produced which went by the name of 'sling,' without any granulated sugar.

Plate 2.
Major A. J. Boyd's Sugar Mill and Boiling House, "Ormeau," Pimpama, 1869.

Plate 3.
The House and Garden and Cane Nursery.

"To give an idea of the amount of work which such a mill would do daily, the writer, who erected one on his plantation, 'Ormeau,' Pimpama, about the year 1869, was well pleased if 1,800 gallons of juice were obtained from a day's crushing. The average was about 800 gallons, and it took about 20 tons of cane to make 1 ton of sugar.

"Some growers drained their sugar in wooden bins, the bottoms of which were perforated with numerous holes, into each one of which a stick of banana stalk was stuck. This was a terriby slow process, and the resulting sugar still held a certain amount of molasses, which in course of transit oozed through the mats in which the sugar was in those days marketed. One mill-owner, having read up the 'claying' of sugar in the West Indies, placed a layer of some kind of white clay on top of the sugar in the bins and freely watered it. To some extent, this watering washed away the molasses from the sugar, which then had a dull, gray appearance, but saleable at a slightly higher figure than the dark, brown 'Muscovado.' Later on centrifugals, Bauer-pans, and Wetzel pans were introduced, into which the steam passed through coils. Triple effets and vacuum pans had not then arrived. The cost of such a mill as I have described was about £200, and the crushing power was so weak that juice could be squeezed out of canes which had been passed through the rollers. And to conclude, how were the canes passed through? A man sat on the bedplate of the mill and fed the canes one by one. If three canes, or even two of extra thickness should attempt to pass together, the mill stopped. The number of hands required to work this primitive machine was a horse-driver, two cane carters, a sugar boiler, four men skimming the pans, one man at the final tache, one man working the crane, one fireman, one man at the subsiders, one man to feed the mill—a total of thirteen all told. When the centrifugals were installed in 1868 and an engine took the place of horses, two mechanics were needed."

It was soon ascertained that cane could only be cultivated profitably in areas that were at a small distance from the sea. "This distance differed in different localities, but 30 miles appeared to be the utmost limit, while the more tender canes seldom did well at a greater distance than 12 miles from the sea." It was also reported that frost was the most serious enemy which the canegrowers of Australia had yet encountered. During the winter of 1869 the cutting effects of frost laid low hundreds of acres of cane.

The industry at that period was almost entirely carried on by coloured labour introduced from the South Sea Islands. On 15th August, 1863, the "Don Juan" schooner arrived in Brisbane bringing about eighty Kanakas. This was the first recruiting vessel in the trade. As plantations increased this class of labour was brought over in larger numbers every year. In the absence of Government regulations, the traffic was greatly abused, and on 4th March, 1868, with, as it was said, nearly 1,000 Polynesians already in Queensland the first of several Acts passed by the Parliament of the colony dealing with this question received the Royal Assent. It was an Act intended to prevent abuses and to secure to the Polynesian labourers proper treatment and protection, as well as to secure to the employer the due fulfilment by the immigrant of his agreement.

Subsequent to 1868 in connection with the regulation of coloured labour, two Acts were passed by the Imperial Government between 1872 and 1875; eight by the Queensland Government from 1880 to 1913; and thirteen by the Commonwealth Government from 1901 to 1912.

The minimum rate of pay to Polynesian labour was about £6 per annum and food and clothing, the annual cost per head being about £27. The food allowed to Kanakas under the 1868 Act was bread or flour 1 lb., beef or mutton 1 lb. (or fish 2 lb.), 5 oz. of molasses or sugar, and 2 lb. of vegetables per day; 1½ oz. of tobacco, 2 oz. of salt, and 4 oz. of soap per week. The Kanakas generally arrived skinny and left in strong and healthy condition. When returned to their islands a good many came out again. There was considerable opposition, however, but an article in favour of black labour and its relation to Mackay stated that "were it not for sugar that town would in all probability consist of a couple of stores and a 'pub' or two, with a population of fifteen to twenty souls and the land in the hands of the squatters; but now, though small, it is one of the richest and most thriving towns in Queensland."

In 1875 a disease termed "rust" broke out in the cane. This, combined with an excessive rainfall, brought ruin to many sugar-growers. The financial institutions became alarmed, and refused to render further aid. Planters, however, were too energetic to let their estates go out of cultivation. The variety affected was known as the "Bourbon" cane, but it was noticed that small patches of "Rappoe" or "Rose Bamboo" were not touched. Those who survived the blow commenced the cultivation of this and other varieties, and confidence was soon restored, though many plantations changed hands.

Up to 1875 the varieties of cane grown were few, but subsequently large numbers were introduced. At this period it was stated that cane was bought by weight, and indeed it was so for a long time afterwards. The saccharometer was said to be used sometimes, but the polariscope was only known by hearsay. Vacuum pans were at that time coming into use in the mills, and the sugars were all centrifugalled in 1880.

During 1879 and 1880 a rush set in for Queensland sugar lands, and plenty of capital was made available. The production of sugar in 1870 and 1880 is given as follows:—1870—2,854 tons; 1880—15,681 tons.

At this period each Australian colony had its own tariff, and it would perhaps be of interest to record the rates in each State on sugar, molasses, rum, &c., as set out in Mr. Roth's report on the sugar industry, published in 1880. The tariffs are—

I. QUEENSLAND.

Import duty—

Refined sugar	6s. 8d. per cwt.
Raw sugar	5s. „
Molasses	3s. 4d. „
Rum	10s. per gall.

Excise—

Spirits distilled within the colony from sugar-cane, a duty of two-thirds of the duties which are payable upon spirits of a like description imported into the colony.

II. NEW SOUTH WALES.

Import duty—

Refined sugar	6s. 8d. per cwt.
Raw sugar	5s. „
Molasses	3s. 4d. „
Rum	10s. per gall.

Excise—

On spirits made or distilled within the colony from sugar which has paid Customs duty 9s. 5d. per gallon.

III. VICTORIA.

Import duty—

Candy sugar	2d. per lb.
Glucose	3s. per cwt.
Raw sugar	3s. „
Refined sugar	3s. „
Molasses	3s. „
Rum	10s. per gall.

IV. SOUTH AUSTRALIA.

Import duty—

Sugar	3s. per cwt.
Molasses and treacle	3s. „
Rum	10s. per gall.

V. WESTERN AUSTRALIA.

Import duty—

Sugar	3s. per cwt.
Molasses and treacle	3s. „
Rum	14s. per gall.

VI. TASMANIA.

Import duty—

Rum	12s. per gall.
Loaf and crushed sugar, net	1d. per lb.
Other sugars, net	6s. per cwt.
Molasses, net	3s. 6d. „

And so in proportion for all sugars or molasses for any greater or less quantity than 1 cwt., not being less than 28 lb.

The net price realised for sugar for the five years preceding 1880 was about £22 10s. per ton for raw sugar. Mills turning out good whites realised higher prices. Mr. Roth said the average was low, not merely on account of the quality of the sugars, but in consequence of many of the small men being pushed for funds they were obliged to sell whether the market suited them or not.

The following are the net returns given per ton of sugar for Alexandra Mill, Mackay:—

	£	s.	d.
1868	32	0	0
1869	31	14	0
1870	28	16	0
1871	25	19	9
1872	25	5	10
1873	24	0	0
1874	18	5	1
1875	22	16	1
1876	24	8	3
1877	21	4	9
1878	20	5	3

When Queensland began to export the balance of sugars manufactured above the amount consumed, the price fell to its value in the world's market. The largest return any mill had made up to 1880 was 33 per cent. on its capital.

The consumption of sugar in Queensland with a population of 210,510 in 1878 was given as 92·13 lb., and was higher than in any other State; the lowest being South Australia, 71·31 lb.

[TO BE CONTINUED.]

THE 1929 FIELD WHEAT CROP COMPETITION.

By H. C. QUODLING, Director of Agriculture.

Although excellent rains fell in April throughout the wheat belt, the normal planting and growing season proved exceptionally dry, so much so that the initial arrangements made for the lodgment of entries and their confirmation at a later date could not be strictly adhered to. When good rains were experienced, however, in October the situation improved so rapidly that the Eastern Downs H. and A. Association, Warwick, made a special appeal and obtained a number of post entries, with the result that thirty-nine crops were judged in the Warwick and nine crops in the Toowoomba district respectively.

The competing crops gave indications generally of fairly high yields, these being obtained without recourse to fertilisers, the dominating factor in this respect being largely that of good preparatory cultivation, which undoubtedly enabled the crops to survive until the long-looked-for rains came just in time, as it proved, to ensure a bountiful harvest.

The practice of early planting once again demonstrated its value and enabled the wheat generally, not only to escape rust but to return also a higher yield. In the case of a few backward crops, however, soft and rapid plant growth, synchronising with exceptionally humid conditions, promoted the development of rust to such an extent that two entries were cancelled; otherwise the presence of the disease was not of a serious nature in the other competition crops, but cognisance had, of course, to be taken of it in allocating points.

PLATE 4.—"DUKE OF YORK" WHEAT, GROWN BY ZIESEMER BROS., BONGEEN, 1929. Yield, 3,500 bags from 300 acres. The dark line near the skyline is the edge of an area of red-chaffed wheat.

Apropos of this particular competition, two classes of competitors were observed, the one who had made up his mind to compete before the season commenced; and the other who at the eleventh hour was out to assist his society in promoting a competition in the interests of the district. All credit is due to those who helped in this latter way, but the fact remains that too many points were lost for impure seed—for instance, the presence of barley, oats, &c.; also for ball and flying smut, and in a few cases for flag smut. Precautionary measures to meet these disabilities in the case of individual growers will naturally do much indirectly to ultimately improve the position of the industry. Obviously, also, the recent arrangement made between the Minister for Agriculture and the Wheat Board to have growing crops examined, with a view to obtaining grain as true to type as possible for use as seed next year after it is cleaned and graded, should be of some assistance to prospective competitors in future competitions. If the latter became a regular fixture much could be done by individuals to work up their own supplies of seed from ears selected in their own fields, or from pure stocks raised by the Department of Agriculture here, or as may be obtainable elsewhere. If, however, it is intended to import seed from the South, permission to do so should first be obtained from the Minister for Agriculture in Queensland so as to obviate the possible introduction of flag smut infected seed.

The standard of purity of crops in this State might reasonably be improved by confining the present or prospective Wheat Board premium for seed to those persons who enter for a crop competition, with the proviso that additional stocks of premium seed could be drawn, if required, from larger areas of land cropped with the same variety by each or any individual competitor.

FIELD WHEAT COMPETITION.

TOOWOOMBA DISTRICT.

Name and Address.	Variety.	Trueness to type and purity.	Freedom from disease.	Evenness of crop.	Condition.	Cleanliness.	Estimated Yield. Bushels per acre.	Total Points.
One point for each bushel up to 24 bushels, half a point for every additional bushel	..	20	30	20	10	20	..	..
*Zeisemer Bros., Bongeen	Duke of York	19·0	29·0	18·5	9·0	19·0	37·0	125·0
†G. J. Will, Kincora, Pittsworth	Duke of York	17·5	29·0	20·0	9·5	19·0	34·0	124·0
‡G. J. Will, Kincora, Pittsworth	Gluyas	18·0	29·0	18·5	9·0	18·5	36·0	123·0
C. Kreig, Brookstead	Duke of York	18·0	28·0	18·0	9·0	19·0	32·0	120·0
F. Flegler, junr., Irongate, Pittsworth	Clarendon	16·5	28·0	17·0	7·5	17·5	40·0	118·5
C. Kreig, Brookstead	Duke of York	18·0	27·0	17·5	8·0	18·5	33·0	117·5
H. C. M. Sharpe, Lavelle, Milmerran	Pusa	17·5	27·0	17·0	8·5	18·0	32·0	116·0
J. Flegler, junr., Irongate, Pittsworth	Currawa	16·5	27·5	17·0	8·0	17·5	34·0	115·5
Zeisemer Bros., Bongeen	Pusa	17·5	27·0	16·5	8·0	17·5	34·0	115·5
WARWICK DISTRICT.								
*F. Armstrong, Headington Hill	Pusa	17·5	28·5	17·5	9·0	17·0	45·0	124·0
†P. Imhoff, junr., Elphinstone	Duke of York	19·0	28·0	18·0	9·0	18·0	36·0	122·0
‡E. T. Box, Junabee	Waratah	17·0	27·5	17·0	8·0	17·5	42·0	120·0
C. F. Gillespie, Junabee	Roma Red	18·5	28·0	18·0	8·5	18·0	33·0	119·5
Gillam and Vaughan, Spring Creek, Clifton	Pusa	16·5	26·5	18·0	8·5	18·0	40·0	119·5
Free Bros., Junabee	Waratah	12·0	28·5	18·5	9·0	18·0	42·0	119·0
S. L. Saal, Pilton	Pusa	17·0	26·5	16·5	8·5	17·5	42·0	119·0
N. Skoien, Pilton	Pusa	16·5	27·0	15·5	8·5	17·5	42·0	118·0
D. Conway, Swan Creek	Waratah	17·5	27·0	17·5	7·0	18·0	38·0	118·0
W. G. Skerman, junr., Willow Vale	Clarendon	15·0	27·5	18·5	9·0	17·5	37·0	118·0
Mrs. N. I. Skerman, Willow Vale	Clarendon	15·0	27·5	18·0	8·5	17·5	38·0	117·5
T. C. Fletcher, Tannymorel	Waratah	16·0	27·0	16·5	7·5	18·0	38·0	116·0
T. J. Martin, Hermitage	Duke of York	18·0	27·0	18·0	8·0	17·0	32·0	116·0
R. F. Kemp, Junabee	Pusa	16·5	28·0	16·0	8·5	17·5	35·0	116·0
J. McGovern, Headington Hill	Pusa	16·5	27·0	17·0	8·0	17·5	36·0	116·0

FIELD WHEAT COMPETITION—*continued.*

WARWICK DISTRICT—*continued.*

Name and Address.	Variety.	Trueness to type and purity.	Freedom from disease.	Evenness of crop.	Condition.	Cleanliness.	Estimated Yield. Bushels per acre.	Total Points.
One point for each bushel up to 24 bushels, half a point for every additional bushel	..	20	30	20	10	20	..	..
D. McVeigh, Junabee	Waratah	16·0	22·0	18·0	8·5	17·0	42·0	114·5
E. J. Walsh and W. Palmer, Maryvale	Pusa	17·0	26·0	15·5	7·5	17·5	38·0	114·5
J. Brownlie, senr., Junabee	Duke of York	15·5	27·0	17·5	7·5	17·5	32·0	113·0
W. Sprott, Pilton	Pusa	15·0	26·0	15·5	8·5	16·0	40·0	113·0
J. Hallman, Freestone	Pusa	16·0	26·0	16·5	7·5	17·0	34·0	112·0
Con Roche, Maryvale	Pusa	15·0	27·0	15·5	8·0	17·0	34·0	111·5
L. T. Gillespie, Pilton	Currawa	15·5	24·0	17·5	7·5	16·5	35·0	110·5
J. J. Kemp, Junabee	Waratah	17·0	22·0	16·0	8·0	16·5	38·0	110·5
E. G. S. Bell, Clifton	Currawa	14·0	25·0	17·0	7·5	16·0	38·0	110·5
Gordon White Killarney	Waratah	15·0	26·0	16·5	8·0	15·5	34·0	110·0
S. F. Turner, Sladevale	Pusa	17·5	27·0	16·0	6·5	16·5	28·0	10·95
J. J. Booth, Junabee	Clarendon	13·0	22·0	18·0	6·0	18·0	38·0	108·0
W. T. Crane, Elbow Valley, Warwick	Waratah	14·0	28·0	14·0	6·5	16·5	32·0	107·0
F. E. Gillespie, Swan Creek	Clarendon	17·0	23·0	16·0	5·0	17·0	34·0	107·0
E. McConville, Swan Creek	Pusa	14·5	25·0	17·5	7·0	17·5	27·0	107·0
D. R. Brownlie. Junabee	Clarendon	16·0	20·0	17·0	8·0	16·0	34·0	106·0
Carey Bros., Warwick	Waratah	14·0	25·0	16·5	7·0	14·5	34·0	106·0
T. A. Brownlie, Junabee	Waratah	15·0	23·0	16·5	7·0	16·0	30·0	104·5
W. Chandler, Ellinsthorpe	Pusa	12·0	27·0	16·0	5·5	12·0	39·0	104·0
Alex. Johnson, Swanfels	Clarendon	15·0	24·0	15·5	7·0	14·5	32·0	104·0
P. Conway, Willow Vale	Clarendon	13·5	18·0	17·0	5·0	17·0	38·0	101·5
P. C. Gillespie, Swan Creek	Pusa	14·0	20·0	16·0	5·0	18·0	32·0	101·0
G. H. Guard, Junabee	Clarendon	8·0	22·0	17·0	7·0	16·0	33·0	98·5
J. A. Christmas, Mount Sturt	Pusa	13·0	20·0	18·0	6·0	8·0	39·0	96·5

* First. † Second. ‡ Third.

PLATE 5.

With this fine crop of ''Duke of York'' Messrs. Ziesemer Brothers, of Bongeen, Cecil Plains, were first in the Toowoomba District Competition (125 points) and in the Grand Championship.

PLATE 6.—WINNERS OF THE GRAND CHAMPION PRIZE IN THE FIELD WHEAT COMPETITION, 1929.

Messrs. Ziesemer Brothers alongside one of their tractors on Bongeen, Cecil Plains.

PLATE 7.—MR. G. J. WILL'S FIELD OF "DUKE OF YORK," KINCORA, PITTSWORTH.

Second, Toowoomba District Competition, and Second place with F. Armstrong in Grand Championship with 124 points. It was the only crop that gained full points (20) for evenness.

PLATE 8.—MR. G. J. WILL'S STAND OF "GLUYAS" AT KINCORA, PITTSWORTH.
Third in Toowoomba District Competition with 123 points.

PLATE 9.—MR. C. KREIG'S FINE CROP OF "DUKE OF YORK" AT BROOKSTEAD.

Mr. Kreig is a prominent member of the Wheat Board, a keen advocate of Wheat Crop Competitions as a stimulus to progress in farming.

PLATE 10.—J. FLEGLER, JUNR., AND HIS 1,500-ACRE CROP OF "CLARENDON" AT IRONGATE.

Mr. Flegler is one of the pioneer farmers in the Bongeen district who is cultivating a large area.

PLATE 11.—MR. H. C. M. SHARPE'S FIELD OF "PUSA" ON LOVELLE, MILMERRAN.
This farm is on Belah and Brigalow country, backed by a stand of virgin "scrub."

PLATE 12.

Another view of Messrs. Zeisemer Bros.' crop of "Pusa" on Bongeen, Cecil Plains. Last year 1,600 acres were under wheat, and 3,000 acres have been broken for this year's sowing.

PLATE 13.—THE WINNING CROP. MR. F. ARMSTRONG'S FIELD OF "PUSA" AT PILTON.

First Prize Warwick District Competition (124 points) and Second with G. J. Will (Duke of York) in Grand Championship.

PLATE 14.—THE CROP—"DUKE OF YORK"—OF MR. P. IMHOFF, JUNR., AT ELPHINSTONE.

"Oh, I am the grass that has conquered man
I am the King that is Bread!
Your armies and fleets are but fragile things
That await a nod of my head."

PLATE 15.—MR. E. T. BOX'S FIELD OF "WARATAH" WAS THIRD IN WARWICK DISTRICT COMPETITION WITH 120 POINTS.

PLATE 16.—MR. D. R. BROWNLIE, OF JUNABEE, HAD A GREAT SHOW OF "CLARENDON."
D. R. is a son of J. Brownlie, junr., a pioneer farmer in the Junabee District.

PLATE 17.

This crop of "Roma Red" on Mr. C. F. Gillespie's Junabee property, near Warwick, was remarkable for its trueness to type and purity.

PLATE 18.—"PUSA" WHEAT ON MR. S. L. SAAL'S FARM AT PILTON.

Mr. Charles Clydesdale, Assistant Instructor in Agriculture, who, in co-operation with Mr. R. Soutter, Manager of the Roma State Farm, and under the direction of Mr. H. C. Quodling (Director of Agriculture), has done much to contribute to the success of the wheat-growing competitions, is in the picture.

PLATE 19.—MR. N. SKOIEN'S EXCELLENT STAND OF "PUSA" AT PILTON.

PLATE 20.—MR. JAMES MCGOVERN'S PADDOCK OF "PUSA" AT HEADINTON HILL.
The bonny colleens, Misses Kathleen and Norah McGovern, typify very charmingly the spirit of young Australia.

PLATE 21.—ANOTHER FINE CROP WAS THAT OF MR. W. G. SKERMAN, JUNR., WILLOWVALE, WHO SPECIALISED IN "CLARENDON."

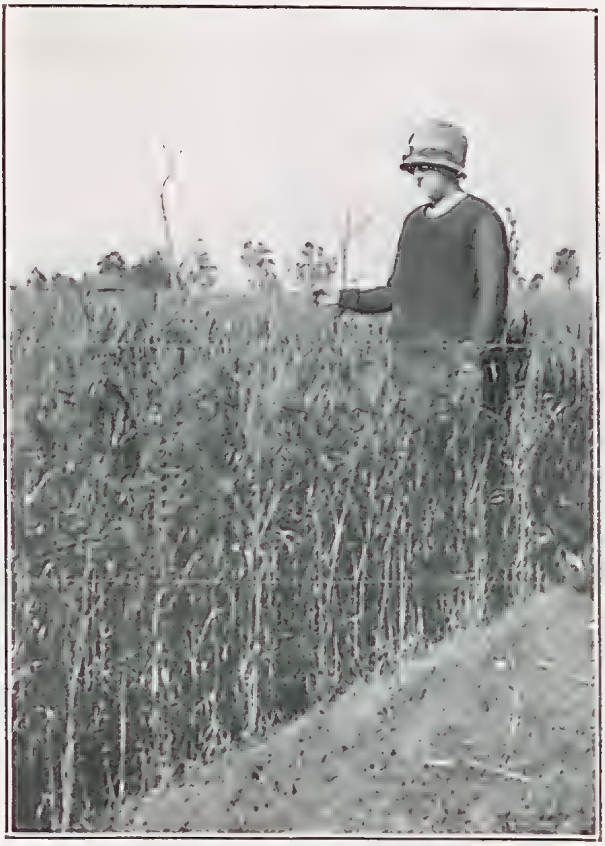

PLATE 22.—MR. D. MCVEIGH HAD AN EXCELLENT CROP OF "WARATAH" AT JUNABEE.

Mrs. McVeigh, who is also keenly interested in crop competitions, is in the picture.

PLATE 23.—A FIELD OF "PUSA" ON THE PROPERTY OF MESSRS. E. J. WALSH AND W. PALMER, MARYVALE.

Mrs. Walsh, who is in the picture, is another keen agriculturist.

PLATE 24.—MR. W. SPROTT, OF PILTON, HAD A FINE CROP OF "PUSA."

A portion of Pilton Station is used for share farming. Mr. Sprott was the winner of a previous competition.

"I am a song that the need of man has sung
From the soil at his feet;
Food-giver, keeper and saviour of life,
I am the grain that is wheat."

PLATE 25.—MR. J. HALLINAN, OF FREESTONE, HAD A FINE CROP OF "PUSA."

PLATE 26.—MESSRS. CAREY BROS.' FINE CROP OF "WARATAH" AT WARWICK.

"Over the face of your rolling hills, over your plains afar,
I have strung you a necklace of gold to wear whose fame is like a star."

PLATE 27.—"PUSA" WHEAT ON MR. W. CHANDLER'S PROPERTY, ELLINTHORPE, DARLING DOWNS.

There is some rich country on Talgai West, and the young farmer in the field is obviously proud of his share in raising the crop.

PLATE 28.—A FIELD OF "NOVO" ON MR. W. MCKENZIE ALLEN'S FARM AT EMU VALE.

This crop was non-competitive.

PLATE 29.—A FIELD OF "DUKE OF YORK" ON MR. J. T. MARTIN'S PROPERTY AT HERMITAGE.

To-day wheat-growing has become a highly specialised business on the Darling Downs, and progressive farmers in every district give close study to the details of agricultural practice that make for high yields.

PLATE 30.—A NON-COMPETITIVE CROP OF "PUSA" GROWN ON MR. EVANS' FARM, PILTON.

PLATE 31.—REAPER THRESHERS AT WORK ON ZIESEMER BROS. FARM AT BONGEEN. 1,200 bags were taken off first round; three tractors and five harvesters were employed.

THE BOUNTIFUL SOUTH BURNETT.

The "South Burnett Times" has this to say of district progress:—Twenty-five years ago the South Burnett district was of no greater account than dozens of other similar localities in the State where the forest lands fattened a fair quota of Herefords and the scrub lands were looked upon merely as harbours for vermin and refuges for "scrubber" cattle. True that Nanango was then an old township as the administrative centre of the then pastoral district; but Kingaroy and Wondai were in swaddling clothes; Murgon's only architecture was an 8 by 10 galvanised iron railway station; and Goomeri comprised only the railway buildngs and trucking yards. What a metamorphoris has been effected in the interim—how the primeval wildernesses of scrub-clad wastes and far-flung little-improved cattle runs have been transformed into what may be confidently stated to be the most productive district in a rich State—is revealed in the "Report of the Registrar-General on Agricultural Production for the year 1928" recently to hand. In last issue it was commented that the maize production for 1928 of Nanango and Weinholt districts comprising the South Burnett, 1,129,502 bushels from 24,822 acres was easily first, Atherton with 901,642 bushels from 21,408 acres being next. But it is perhaps in the figures of the dairying industry that the productivity of the South Burnett is best displayed. The number of cows in milk in Weinholt-Nanango is shown as 58,284 (next Gympie, 38,906), dairying establishments 1,844 (Gympie 1,163), milk production 20,766,965 gallons (Gympie 12,511,288) and butter made 10,741,654 lb. (Gympie 8,025,578). Yet more remarkable, however, is the extent in which the South Burnett outstands in the pig industry. The number of pigs in Nanango-Weinholt is shown as 32,462, both of the subdistricts exceeding Gympie's 12,365, the next being Beaudesert with 9,401. In the matter of areas of artificially sown pastures (Rhodes grass, paspalum, &c.) Gympie's acreage of 102,436 exceeds the South Burnett total of 94,199, though the Registrar-General would probably find some difficulty in explaining why Nanango's total of 54,954 acres in 1927 should have dropped to 47,362 acres in 1928 although additional scrub areas had been felled and grassed. In area under cultivation South Burnett with 92,777 acres comes first, with Clifton 91,820 acres next. In the value of farm machinery and implements South Burnett's total of £419,980 is second only to Ayr with £673,910 (sugar production) though it is a big drop to the next, Mackay (also sugar) £333,672. In farming and dairying, 6,322 persons are employed in the South Burnett as against 4,808 in the next district (Gympie). In the number of poultry on farms South Burnett's total of 72,367 is second only to Brisbane's 75,428, the third highest figures being for Maroochy. The report does not disclose the South Burnett domination of the peanut industry of a gross annual value of upwards of six figures sterling, but the area under "other crops" in Nanango and Weinholt is shown at 9,126 acres, although 994 is the largest area under similar heading in any other district. The pre-eminence to which our district has attained in matters agricultural and pastoral is proof positive of the progressiveness and industry of its pioneers, but its potentialities are in no way exhausted, and further records will yet be achieved by our rich heritage.

A DISCUSSION ON CALCIUM AND PHOSPHORUS DEFICIENCY OF THE SOIL IN RELATION TO ANIMAL NUTRITION.

In December, 1928, a meeting was arranged by the Veterinary Association of South Australia, for the purpose of discussing some of the aspects of mineral deficiency of the soil in relation to animal nutrition.

Members of the Department of Agriculture, of the Waite Agricultural Research Institute, of the University of Adelaide, of the Nutrition Laboratory, Council for Scientific and Industrial Research, and of the Veterinary Association met together for the purpose of the discussion, which was opened by the reading of the following papers:—

1. *"Some Diseases of Stock in South Australia Considered to be Due to Mineral Deficiency." C. T. McKenna, B.V.Sc., M.R.C.V.S.*
2. *"Soil Deficiency in Calcium and Phosphorus." Professor J. A. Prescott, M.Sc. (Manc.).*
3. *"The Physiology of Phosphorus and Calcium in Animal Nutrition." Professor T. Brailsford Robertson, Ph.D., D.Sc.*

These papers were published in "The Journal of Agriculture of South Australia" for July, 1929, and through the courtesy of that Journal they are now reprinted for the benefit of our readers.

PAPER I.

SOME DISEASES OF STOCK IN SOUTH AUSTRALIA CONSIDERED TO BE DUE TO MINERAL DEFICIENCY.

Arranged and presented for the Veterinary Association by C. T. McKENNA, B.V.Sc., M.R.C.V.S., Veterinary Officer, Stock and Brands Department, Adelaide.

CALCIUM and phosphorus are necessary for the development of the skeleton of animals as well as for bodily functions. A deficient intake of these minerals places a limit on the full development of an animal; but, apart from this, there are definite diseases which result from an inadequate or an unbalanced intake. In many instances it is mainly a matter of the degree of the deficiency which determines the presence or absence of frank abnormality or disease.

It is in dairy cattle, and to a much less an extent in sheep and pigs that diseases of mineral deficiency have been principally observed. The horse in this State appears to be comparatively free from frank manifestations of such diseases. Cases of Pica have occurred, where licking of earth, gnawing of bark off trees, and eating of superphosphate have been observed. Only one case of bone-chewing has been recorded, and that occurred in an outbreak of Botulism in farm horses at Mannum. A condition usually known as Osteoporosis of the horse, which is common in Victoria, has not been observed in this State.

There are several diseases in dairy cattle which are recognised as being due either to deficient intake of phosphorus or calcium, or to disturbance of the metabolism of these minerals which may be associated with deficient intake either of the minerals or some other substance essential to their proper assimilation and use by the animal. These diseases are:—

1. Pica.

Pica or depraved appetite, which manifests itself in a desire to chew bones chiefly, and to a less extent, dirt, putrefying carcases, leather, &c. Badly affected cattle are usually in poor condition, unthrifty in appearance, move in a listless manner, and their milk supply is below normal. The best cows, i.e., the best milkers, are generally the worst cravers. It is considered that the eating or chewing of putrefying bones and flesh denotes a bad case of Pica, or in other words, a bad craver. Again, there is a seasonal incidence. The craving is acute during the dry time of the year, and tends to diminish or disappear when the flush of feed comes on. During periods of drought Pica is more common and more intense in its manifestations.

With the probable exception of certain small, rich areas of country like the Booborowie Flats and Reclaimed Murray River Lands, there are no parts of South Australia where we can say that Pica does not exist.

Some of the worst "Pica" areas of the State are:—

(*a*) Coastal area extending north of Adelaide to Port Wakefield.

(*b*) All newly opened mallee lands.

(*c*) Kangaroo Island.

(*d*) Coastal areas of the West Coast (Eyre Peninsula).

(*e*) Lake district (River Murray Mouth).

BOTULISM.

Pica is associated so closely with one disease which is common in cattle—I refer to Botulism—that that disease is worth mentioning here for two reasons:—

(*a*) It is an indication of the incidence and severity of bone-chewing in the State, and

(*b*) Many cases of so-called "Paralysis" in cattle associated with bone-chewing are met with, which are termed Botulism, but which may only be a form of nutritional disease.

Up to a few years ago Botulism was exceptionally prevalent in the mid-north areas of this State. At that time it was known as "Dry Bible." Orroroo, which was then a big dairying centre, was a particularly notorious area for losses from this disease. With the advent of phosphatic manures in wheat cultivation, the eradication of vermin, and the proper disposal of carcasses, much of this trouble has now ceased, though it is still comparatively common in this area.

Botulism in cattle in due to the absorption from the digestive canal of toxin produced by at least three types of Bacillus Botulinus. The toxin is formed in damaged food or in decaying animal tissues. When the disease is produced by the ingestion of decaying animal tissues, Pica is usually an essential link in its production. Botulism is usually fatal. The symptoms are briefly as follows:—(1) In-co-ordination of movement, which is first indicated by stiffness of gait. There is a general loss of muscle power, and later the animal goes down and is unable to rise. (2) There may be paralysis of powers of mastication and deglutition. (3) Obstinate constipation and unthriftiness.

2. Paralysis.

Under this heading are grouped various forms of paralysis which are met with all over the State. These cases are extremely common, and are met with under the most diverse conditions. It is possible that these diseases have a nutritional basis, but it is not certain. Some examples are:—(*a*) *Milk Fever* (Parturient Paresis).—Recent investigation of this disease has emphasised the fact that Tetany is the essential clinical manifestation, and the belief is expressed that the essential nature of this is a Parathyroid failure, with a resultant fall in blood calcium. (*b*) *Post Partum Paralysis.*—Cows in high condition are most frequently affected. They go down after a normal calving and cannot rise. The hindquarters appear to be paralysed. (*c*) *Anti Partum Paralysis.*—The symptoms are similar to the post partum type, but the disease usually occurs within the month prior to calving. (*d*) Another type of "Paralysis" has been reported from various parts of South Australia, and particularly, during the last two years, in dairy herds in the Salisbury district. A number of the herd go down suddenly and are unable to rise. They attempt to do so, but cannot use the hindquarters. Otherwise the affected animals appear normal. They are in different degrees of lactation, and cases have been recorded from March to September.

3. Stiffness.

Several types of so-called "stiffness" have been noted and recorded in cattle. Affected animals have an unthrifty appearance, and are poor milkers. They move in a slow, listless manner, and they take short, stilted steps. Many suffer from constipation. The condition is generally associated with bone-chewing, and marked improvement is obtained by the regular administration of bone-meal to affected cows.

4. Rickets.

Cases of this disease have been observed in young dairy stock, but it would appear to be a rare condition in this State.

DISEASES OF SHEEP.

The diseases of sheep which may be mentioned are as follows:—

1. Pica.

This affection is uncommon in sheep, and has only rarely been recorded. A case of bone-chewing is mentioned later.

2. Paralysis.

As in cattle, sheep show various forms of this condition. Examples are:—

(a) *Pregnancy Disease.*—It is very common on the wheat and sheep farms of the Mid-north, and also in those parts of the State where breeding ewes are kept on small areas of rich feed. Severe losses have occurred during last weeks (2-4 weeks usually) of pregnancy. They are commonly in high condition, and usually are carrying twin lambs. Signs of the malady are that ewe lags behind and separates from the rest of the flock. Nervousness, grinding of the teeth, and a high-stepping movement have been noticed. Some ewes apparently suffer from loss of sight, which appears to be of nervous origin. Twitching of muscles around nostrils and mouth has been noted. Later there is loss of control of hindquarters, and ewe goes down and is unable to rise, though attempts to do so are made. The post-mortem examination shows an abnormal condition of liver (fatty infiltration of a severe type). Although this disease probably has a nutritional basis, there is as yet no definite evidence that it is associated with a deficient mineral intake.

(b) This type of Paralysis can best be described by giving a description of two outbreaks:—

(1) Coomandook Outbreak (October, 1928).—A wheat and sheep farm in this area was concerned. The farm had been established twenty years, and all pastures had been topdressed. The Paralysis was confined to lambs, 2-4 months old, and 11 per cent. were clinically affected. The trouble started at the beginning of August. *Symptoms.*—Affected lambs lag behind flock and go down after a short walk. They get worse, and are unable to rise, or if they do only stagger a few yards and go down again. Some are affected chiefly in hind limbs, others in fore limbs. Muscular trembling of limbs was noticed. Otherwise the affected lambs appeared normal.

(2) Keith Outbreak.—A similar condition was observed in a mob of 200 lambs about four months old on a wheat farm in this area; forty were affected. The majority were lying down when first seen; on disturbing them, they only remained on their feet for a few minutes. Some only showed a stilted gait. Their condition was good. Several which were examined showed muscular tremblings in their hind limbs. In connection with this outbreak, the following information was obtained:—For portion of year sheep were put on bush country, which is a part of the 90-mile Desert. Whilst there sheep have been frequently observed chewing bones. Again, limbs of some are easily fractured, and bones of many can be cut with a knife.

3. Lameness.

A peculiar lameness in sheep has been observed and reported on certain holdings in the north-east of the State. On one station 40 per cent. of the ewes in 1921 showed lameness, and many of these had a deformity of the elbow joints. In 1925 a similar per cent. of the ewes showed the same condition. Certain areas (water-courses) of the holding seem to be associated with the trouble.

The condition is an osteo-arthritis of elbow joints chiefly; all joints of limbs may show more or less erosion of articular cartilages. The bony changes have developed over a considerable period. No evidence of an infective process has been found.

4. Brittleness of Bone.

Reports have been received from farmers in the areas given below that sheep show brittle bones. When catching sheep by a hind limb it commonly fractures. These areas are South-East (Kingston), coastal area of Eyre Peninsula, and southern end of Yorke Peninsula.

In conclusion, we may mention one of the nutritional diseases in the pig. It is recognised that dietary factors, housing, and other forms of management of this animal play an important part in producing the disease. The following condition is very frequently reported:—

The affected pig is first noticed to be paddling with hind legs whilst feeding. There is later slight loss of control of hind legs, accompanied by knuckling over at the fetlock joints. Finally pig goes down and seems to be paralysed in hindquarters. It often sits up like a dog and can pull itself along with the forelegs to feed. Swine of all ages can be affected, and they are usually in good condition. Although this disease is apparently nutritional in origin, its exact cause has not yet been determined.

PAPER II.

SOIL DEFICIENCY IN CALCIUM AND PHOSPHORUS.

By J. A. PRESCOTT, M.Sc. (Manc.), Waite Professor of Agricultural Chemistry, University of Adelaide.

In dealing with the subject of soil deficiencies, the agricultural chemist in the past has considered the problem mainly from the point of view of crop production and plant nutrition, rather than from that of animal health. The chemical and physical characteristics of the soil are known to have a direct influence on the character of the pasture, and the main object and interest in the top dressing of pasture land has been that of increasing the carrying capacity of the land rather than the improvement in the health of the stock, although the two were naturally known to be frequently associated. Of the elements essential for the proper nutrition of plants, only three—nitrogen, phosphorus, and potassium—have acquired the status of recognition as artificial fertilisers, salts of calcium being usually considered as soil amendments rather than as plant foods, the purpose being to correct soil acidity or alkalinity, or the improvement of physical properties.

The quality of a pasture from a nutritional point of view is controlled by a number of purely botanical factors, such as stage of growth and the relative proportions of grasses, leguminous plants, and what are generally known as miscellaneous herbage. Modern livestock, with their higher output of meat, wool, and especially milk, make special demands on the pasture, and what may possibly be a bare maintenance ration for the frugal Merino sheep may be seriously deficient for a dairy cow in full milk.

It is a well-known fact that the energy-value of poor and healthy pastures is approximately the same—in the neighbourhood of 270 calories per 100 gms.—but that in mineral content the variation is much more important. At the present stage of investigation, the study of the soil and of the pasture must be correlated with experimental work with the animal, and our diagnosis of soil deficiency must be based rather on the report of the veterinarian than on a chemical examination of the soil, until such times at least as a standard of reference has been established.

The known deficiency of the soils of the Australian wheat belt in phosphorus has been established, not so much by a chemical analysis of the soil as by an important series of field experiments in the various States, although the chemical analyses certainly directed the attention of our agriculturists to the need for these experiments.

Soil Calcium.

In Australian soils, calcium may exist in at last four forms—

Gypsum. Calcium Carbonate. Exchangeable Calcium. Mineral Calcium.

Gypsum occurs either as a natural product of soil and rock weathering, or when in larger amounts as a saline deposit such as would occur under estuarine or salt marsh conditions. Crystals of gypsum generally occur in the lower horizons of some of the heavy black soils characteristic of parts of New South Wales and of the Wimmera, while soil horizons rich in gypsum are known from the irrigation settlements of Mildura and Renmark.

Calcium carbonate is a universal soil constituent in our more arid regions, and most of our soils receiving 20 in. and less of rain show a characteristic lime enrichment in the lower soil horizons. It is difficult to believe that under these conditions

a true deficiency of calcium can exist. Even where calcium carbonate is absent, calcium forms the principal reactive constituent in the exchangeable bases of the soil, and a leaching out of the calcium in this form soon shows itself in soil acidity. Mineral calcium may be taken to indicate the calcium which is present in the unweathered silicate minerals, and will consequently have a low availability. The first three forms of calcium are all readily available, and in fact the soil solution consists primarily of a dilute solution of calcium bicarbonate.

The safest index of relative calcium deficiency in the soil is probably the hydrogen ion concentration. On the pH scale, with a neutral point at pH7, calcium carbonate in equilibrium with the carbon dioxide of the atmosphere gives a value of pH 8.4, while in Australia acid soils are known from pH 4.0 on the acid side to pH 9.6 on the alkaline soil. The reaction of the soil appears to depend on two principal factors, one the amount of leaching by rain or swamp drainage, and the second the amount of calcium carbonate present in the original parent material. The volcanic ash of Mount Gambier is, for example, relatively rich in calcium carbonate, and hence soils on this formation are frequently less acid than would be expected from a 30-in. rainfall. A critical pH value for many pasture plants would appear to be in the neighbourhood of pH 6, although some crops, such as oats and potatoes, will flourish in more acid soils. In South Australia, soils more acid than pH 6 occur only when the rainfall is 30 in. or more, and it is mainly in the Adelaide Hills that one would look for cases in which the soil would be likely to respond to treatment with lime. The lower Murray Swamps are also characteristically acid soils.

It is evident that veterinary troubles, due directly to calcium deficiency in the soil, could be expected to occur in a relatively limited area of the State.

Soil Phosphorus.

All soil phosphorus must ultimately owe its origin to the apatite that occurs in most igneous rocks. In soils derived from sedimentary rocks, the phosphorus present may have passed through organic form at some time or other, but will probably be found in the soil principally as calcium phosphate or fixed in the complex reactive alumino silicate portion of the soil which is responsible for base exchange. The quantity of phosphate in the soil is much less dependent on climatic conditions than is the case with calcium, and as it is never very high, is probably mainly related to the geological origin of the soil. In South Australia few soils have a high content of phosphoric acid. The volcanic ash of Mount Gambier is outstanding in this respect.

A statistical review of the information available in the records of the various State chemical laboratories concerning soil phosphate and the correlation of this information with the result of field experiments, and the occurrence of stock disease would be of considerable value; but it will be sufficient to indicate a few cases in which such definite information is available, using the total phosphoric acid present as a crude, but only available, measure of the phosphorus content of the soil. Table I. is very instructive indeed, and illustrates the relative poverty of South Australian soils in this respect.

Phosphate Content of Some Australian Soils, with Special Reference to Phosphorus Deficiency Diseases in Stock.

	Per cent. P_2O_5.
Queensland: Good grazing land	0.37
New South Wales: Black soils	0.18
New South Wales: Red soils	0.12
New South Wales (South Coast): Healthy	0.11
Mount Gambier (South Australia)	0.20-0.40
Wimmera (Victoria)	0.05
Mallee (Victoria)	0.05
New South Wales (South Coast): Bone chewing	0.03-0.05
Queensland: Osteomalacia	0.02
Kybybolite (South Australia): Unthrifty stock	0.014
Waite Institute (South Australia)	0.04
Lower North (South Australia)	0.03

PAPER III.

THE PHYSIOLOGY OF PHOSPHORUS AND CALCIUM IN ANIMAL NUTRITION.

By T. BRAILSFORD ROBERTSON, Ph.D., D.Sc., Chief of the Division of Animal Nutrition of the Commonwealth Council for Scientific and Industrial Research, at the University of Adelaide, South Australia.

Phosphorus.

We are acquainted with four distinct functions which are performed by phosphoric acid in the animal body. These are as follow:—

1. As an integral constituent of nucleic acid, phosphoric acid enters in an essential fashion into the composition of the nucleus of every cell in the body. Since the constituent of the nucleus which stains with haematoxylin is nucleic acid and modern genetic research has shown that those elements of the nucleus which stain with haematoxylin (chromosomes) are the actual conveyors of hereditary characteristics from parent to offspring, it becomes clear that in this sense phosphoric acid forms an essential constituent of one of the governing factors in development.

2. As an integral constituent of the phospholipins, in the form of a substituted glycero-phosphoric acid, phosphoric acid again enters into the composition of every living cell. The phospholipins, in turn, perform a multiplicity of functions. They are unique substances in that, being fats and having the physical properties and solubilities of fats, they are nevertheless soluble in water. When dissolved in water they are able to carry other fats, not normally soluble, into solution. By their influence upon surface-tension they modify the permeability of cells—that is, their capacity to take up from surrounding media materials which are not soluble in water. (Overton, Nathanson, Heilbrunn.) There is reason to suspect that phospholipin is the mobile form of fat in the body, just as glucose is the mobile form of carbo-hydrate. (Bloor.) As structural materials and, perhaps, for the reason that they are very readily oxidisable materials, the phospholipins enter to a remarkable extent into the composition of nervous tissues. To Liebig we owe the aphorism:—"Ohne phosphor, keine gedanke." Of course, as Verwon pointed out, exactly the same aphorism might have been enunciated for nitrogen or carbon or, for that matter, for hydrogen, oxygen, and other elements; but Liebig's statement serves to emphasise the fact that phosphoric acid is singularly concerned in the maintenance of the normal functions of the nervous system.

It also appears, from recent work, that phospholipins can catalyse the synthesis of protein in the tissues, through orientation of the molecules of amino-acids at their surfaces in such a fashion that the amino- and carboxyl-groups of adjacent amino-acid molecules are brought nearer to one another (Robertson, Marston, Wasteneys, and Borsook), and it has been shown that the mitochondria, fine granules in the protoplasm of cells which are believed to be the centres of protein synthesis, are largely composed of phospholipin (Arnold, Horning, and others).

3. The investigations of Embden have shown that the anaerobic oxidation of glucose in muscular tissue, with production of lactic acid as the side reaction, involves the preliminary formation of a hexose phosphate. Phosphoric acid must, therefore, be essential for the normal oxidation of carbohydrate and the production of muscular energy.

4. In the form of disodium phosphate, phosphoric acid plays a minor but essential part in maintaining the neutrality of blood and other tissue fluids (von Bunge, Henderson, van Slyke), through the occurrence of the reaction:—

$$Na_2HPO_4 + CO_2 + H_2O = NaH_2PO_4 + NaHCO_3$$

whereby CO_2 is neutralised without appreciable effect upon the neutrality of the mixture.

5. Finally, as a structural element, in the form of tricalcic phosphate, phosphoric acid is essential for the construction of bones, and, in consequence, the mechanical support of the tissues. This is usually the only function of phosphoric acid to which any attention is devoted in studies on the nutrition of farm animals. A perusal of the foregoing list of ascertained functions of phosphoric acid will reveal at once the inadequacy of this conception of the role of phosphoric acid in the body of an animal. It is obvious that deficiency of this substance in the dietary of an animal must injure its welfare in a multiplicity of ways, and we must expect the pathological syndrome consequent upon such deficiency to be of a very complex character and far-reaching in the modifications of normal function which it may induce.

Calcium.

Calcium, on the other hand, plays, so far as our knowledge as yet extends, only a limited number of roles in the bodily economy. As a structural element it enters, with phosphoric acid, into the composition of bone. For some reason not yet fully understood, but probably related to the maintenance of the colloid structure of protoplasm, calcium ions must always be present in tissue fluids in a certain proportion to the sum of sodium and potassium ions, otherwise normal permeability of the cell-surface cannot be maintained, and disordered function or death will ensue (Leob, Osterhout). In the aggregate of tissues forming a vertebrate animal, the first tissues to display disorder when this ratio is upset are the nervous tissues (Loeb). If the upset of balance is acute and sudden, the cerebellum is the first part of the nervous system to be affected, and the power of the animals to orient and equilibrate themselves in space is lost (Robertson and Burnett). If, however, the upset of ionic balance is gradual and chronic, supplies of calcium are mobilised from other tissues and rendered available to preserve an approximation to the normal ionic (Ca to Na) ratio in the blood. This is shown by the fact that a definite tolerance to citrates can be established by continued injection (Robertson and Burnett), and also by the well-known fact that a continued heavy drain upon the calcium stores of the body, as in heavy milk production with insufficient intake, or continued consumption of plants of the type of *Oxalis*, which are rich in oxalic acid, the bones may be rendered thin and fragile, showing that the calcification of bone is a reversible process, and that the bones are really reservoirs of lime, which can be drawn upon when the need of the animal is sufficiently urgent.

Owing to the diversity of the functions performed by phosphoric acid in comparison with calcium, the proportion of phosphoric acid contained in the body as a whole is somewhat in excess of that required to form tricalcic phosphate. Phosphoric acid must, in other words, be assimilated in excess of the amount necessary to combine with the calcium contained in the body. This is particularly true in the embryo, in which the proportion of nuclear material is high and the bones are, as yet, barely calcified at all. As the animal grows to the adult condition, the proportion of tricalcic phosphate in the body as a whole increases. The changes in the proportions of phosphoric acid to lime which accompany growth have been studied by Sherman and Quinn ("Journ. Biol. Chem.," vol. 1926, p. 667). They show that, in the new-born animal, the proportion of calcium to phosphorus is about one atom of Ca to two of P. During suckling the phosphorus in the body increases sevenfold, the calcium, however, twelvefold, from which we may compute that Ca and P atoms are assimilated at this stage in the proportion of one to one. Now the proportion of Ca to P in tricalcic phosphate is three to two, while the proportions assimilated in suckling are three to three. In other words, there is still 50 per cent. excess of phosphoric acid intake over that necessary to form bone from the lime intake. Corresponding to this we find in milk, besides tricalcic phosphate, a considerable excess of phosphoric acid compounds containing a smaller proportion of lime (casein, phospholipins, &c.). On the whole, between birth and the attainment of adult dimensions, the ratio of Ca to P assimilated is 2.5 to 2—*i.e.*, corresponds to a mixture of equal parts of dicalcic and tricalcic phosphates. During prenatal growth, on the contrary, the proportions approximate to those in monocalcic phosphate.

Monocalcic phosphate	$Ca\ (H_2PO_4)_2$;	Ca : P = 1 : 2
Dicalcic phosphate	$Ca_2\ (HPO_4)_2$;	Ca : P = 2 : 2
Tricalcic phosphate	$Ca_3\ (PO_4)_2$;	Ca : P = 3 : 2

The diversity of purpose for which phosphoric acid can be employed in the tissues of an animal involves its presence therein, as I have indicated, in a diversity of combinations. This raises the question whether any of these various compounds of phosphoric acid, other than inorganic phosphates, may not be more readily utilised by an animal if presented to it in a preformed condition, as they are in the natural herbage, rather than when phosphoric acid is presented in the form of inorganic phosphates. It will be clear from the foregoing that it is not sufficient guarantee of normality to find that bones grow normally, or that the phosphoric acid content of the blood, or even of the whole animal, is normal. Before we can be thoroughly satisfied that the requirements of the animal have been fully supplied, we must ascertain that the relative proportions of the three main classes of phosphoric acid compound in animal tissues—namely, nucleic acids, phospholipins, and phosphates—are present in the animal in the proportions natural for its age.

I have raised this question for two reasons. In the first place, investigations in my laboratory have shown that even such closely related compounds of phosphoric acid as animal and plant nucleic acids may be differently utilised by animals. In the second place, so far as I have been able to observe, attempts to supplement pastures which are deficient in phosphoric acid by means of licks containing inorganic phosphates, although successful in overcoming the most severe symptoms of

deficiency, nevertheless fail to restore complete normality. Even the bones remain more friable than those of animals fed upon pastures which are comparatively rich in phosphoric acid.

Quite apart from the question of organic *versus* inorganic compounds of phosphoric acid, there is another very important reason why the administration of phosphates in a lick may fail to accomplish all that we might hope.

Phosphates taken by mouth cannot be absorbed to any appreciable extent from the stomach. On arrival in the intestine, however, they meet an alkaline medium, and, if lime be present, phosphoric acid will be precipitated as di- or tricalcic phosphate, wholly or in part, in proportion to the calcium present and the degree of alkalinity. It is possible that a part of the calcic phosphates may be held in suspension by colloids, and thus, notwithstanding their insolubility, may conceivably be absorbed from the intestine in a colloidal condition. If absorption does not precede precipitation, or the precipitated phosphates are not absorbed from a colloidal suspension, then the precipitated phosphates of lime must pass through the intestine unaltered, and into the fæces, and thus become lost to the animal and restored to the soil. Reduction of lime in the diet will facilitate absorption, but then some of the phosphoric acid which is absorbed cannot be utilised in bone-formation for lack of sufficiency of lime to manufacture tricalcic phosphate, and consequently the excess over that which can be utilised for other purposes in the body appears in the urine and is lost to the animal by this channel. On the other hand, increase of lime in the diet increases utilisation but diminishes absorption. The animal must, therefore, steer a very fine course between defective absorption on the one hand, and defective utilisation on the other, to obtain the lime and phosphoric acid which it needs for bone formation. It is, in fact, quite readily possible to induce a rachitis-like condition in animals on a diet containing abundance of either phosphoric acid or lime, by simply administering an improper proportion of the two. (McCollum, Hess, and many others.) It is for these reasons, also, that even on a diet of natural foodstuffs the phosphates are rarely utilised to a greater extent than 50 per cent.

Experiments have been undertaken in which the phosphoric acid and lime were administered separately to milch cows, and at different times of the day, with a view to keeping them apart in the intestine by interposing a space between them. Phosphoric acid was administered in the form of sodium phosphate, calcium in a hay which was very rich in lime (Meigs and Woodward, United States Department of Agriculture, Bulletin No. 945, 1921), but I am not aware that the advantages of this procedure have ever yet been quantitatively evaluated. Increase of milk yield was obtained, of course, but was not compared with the increase which might have been obtained by administering the calcium and the phosphoric acid together. Organic compounds of phosphoric acid, however, possess the advantage over inorganic phosphates that the phosphoric acid is only slowly liberated during digestion, and may be absorbed before the concentration of phosphoric acid in the intestine reaches the critical value at which precipitation of calcium phosphates occurs. Glycerophosphoric acid, in particular, which is derived from the partial digestion of phospholipins, forms a soluble calcium salt, and all the salts which it may form in the intestine are so soluble that it is conceivable that they are absorbed as such, without the liberation of free phosphoric acid.

Interesting Experiments.

In this connection, the experiments of Forbes, on the utilisation of various compounds of phosphoric acid and hypophosphorous acid by pigs, are of exceptional interest. (Ohio Agric. Expt. Station, Technical Bulletin No. 6, March, 1914.) The pigs were fed upon a diet which was very deficient in phosphoric acid, and not containing quite enough lime to fulfil the maximum requirements of the animals. It is not certain, therefore, that the utilisation of phosphoric acid was in any instance the maximum attainable had the diet contained more lime. The phosphates, glycerophosphates, and hypophosphites administered were mixtures of the salts of sodium, potassium, calcium, magnesium, and iron. The nucleic acid was derived from yeast. Ten-day periods were employed. In the first experiment, illustrative of the rest, the following were the results obtained:—

Phosphorus Compound Administered.	Per cent. of Phosphorus Administered which was Retained.
Phosphates	51
Nucleic acid	58
Glycerophosphates	47
Hypophosphites	20

It is at once evidence that the reputed value of hypophosphites is mythical.

Although the utilisation of glycerophosphates was not seemingly so good as that of phosphates or nucleic acid, in all of the experiments these animals were the most spirited and lively. They were the only animals which consistently maintained their appetite and displayed no tendency to develop digestive disorders in consequence of the addition of the phosphoric acid supplement to the diet. In a repetition of the experiment, on comparing the breaking-strength of bones from the different lots, the following were among the figures obtained. (It is necessary to bear in mind the fact that all of the diets were moderately deficient in lime):—

Phosphorus Compound Administered.	Gain (+) or loss (—) in Breaking Strength.	
	Femora. Per cent.	Tibiæ. Per cent.
Hypophosphites	—37.0	—39.1
Hypophosphites + Nucleic Acid	—11.6	—26.4
Glycerophosphates	+28.7	+16.4
Phosphates	+11.3	— 4.1
Low phosphorus basal ration	—26.5	—29.5

It is at once evident, from such results as these, that it is not at all a matter of indifference in what form phosphoric acid is administered to animals to supplement their pasture. In our field-station experiments in phosphoric acid deficient districts we propose to administer various supplements, rich in phosphoric acid, and investigate, not only the growth and condition of the animals and their wool, but the effects of the supplements upon the proportions of the three main classes of phosphoric acid compound in the tissues of the animals. This has not hitherto been possible, owing to the lack of a convenient method of estimating nucleic acid. As a result of nearly two years' work, however, we have recently perfected a method which will permit the estimation of the nucleic acid content of 20 grammes of tissue to within 1 per cent. of its value. Standard methods of estimating phosphoric acid in phospholipins and phosphates are, of course, available. Definite organs will be sampled and analysed in normal sheep, sheep upon deficient pastures, and sheep upon deficient pastures which have been supplemented in various ways, and the results of these analyses supplemented by blood and bone analyses. From such experiments it should ultimately be possible to ascertain what admixture of inorganic phosphates and organic supplements will most closely approximate to the provision of phosphoric acid in the forms and proportions in which it is conveyed to animals by pastures which have been heavily supered, or which are naturally rich in available phosphoric acid.

DROUGHT FEEDING OF SHEEP.

FEEDING OF YOUNG LAMBS.

By THOMAS L. ARMSTRONG, Corona, Queensland.*

It will be remembered that in my article in the January issue I remarked that it was anticipated that the losses during the feeding period of the previous year would probably not exceed 6 per cent. This anticipation was more than realised, as is shown by the fact that for the period of twelve months, i.e., from May, 1928, to May, 1929, the total losses were under 5 per cent., and during that period 34,000 lambs were marked and reared (the number entered in the books being the actual number marked), so that it may, I think, be reasonably claimed that our feeding operations during last lear were a success.

The results of a small experiment in the feeding of young lambs which was carried out here in the early part of this year may be of interest to graziers generally.

In February last, owing to the imminent failure of the home pastures, it was found advisable to remove as many as possible of the breeding ewes to agistment areas, and as the ewes had only just finished a second lambing for the twelve months, the result of which was about 33 per cent., it was necessary that the dry ewes should be taken out of the various mobs in order to send them away.

During the mustering and handling necessary to accomplish this object lambs to the number of 511 lost their mothers, and it was decided to endeavour to save their lives by artificially feeding them. For this purpose they were collected in a motor

* In the "Pastoral Review" for October (No. 10, Vol. XXXIX., p. 952).

lorry from wherever they happened to drop out of the various mobs and taken to one of the out-stations, where they were kept in two enclosures, each about 5 acres in extent, and fed in troughs on mixed fodder prepared as follows:—280 lb. ground maize; 150 lb. lucerne chaff; 440 lb. bran; 200 lb. linseed meal.

These ingredients were thoroughly mixed together, and supplied in troughs, which were made from 18-inch strips of plain galvanised iron with rolled edges, which were suspended on parallel wires (which were run through the rolled edges) at a sufficient height so that the lambs could just reach into the bottom of the trough, as it was found by having the troughs as high as possible the danger of smothering through overcrowding was almost entirely done away with.

When the feeding was commenced the lambs ranged in age from two to eight weeks, being mostly of the younger age, and were in a more or less exhausted condition. For the first three weeks they were allowed a ration of 5 oz. of the mixed fodder per day. After the expiration of that period the allowance was increased to 7 oz. per day. After about the fourth week a ration of 2 oz. per day of lucerne hay was supplied to the lambs three times a week, and on the days when the hay was supplied the allowance of mixed fodder was reduced by 1 oz. per head. Fresh water was supplied to the lambs in the enclosures where they were kept. A lick composed of one part of coarse salt to three parts of Nauru phosphate was supplied to the lambs in separate troughs, and of this they partook regularly, though sparingly.

After being fed for eight weeks, during which period there were two wet days during which 5½ inches of rain fell, some of it fairly heavy, the lambs were turned at large on the natural pastures, which as a result of the abovementioned rain were then sufficient. The losses amongst these lambs for the whole period during which they were being fed amounted to eight.

About four weeks after being turned at large, these lambs, with 7,700 other lambs of the same drop which had not been taken from their mothers and which had from the time they were dropped (with the exception of a period of three weeks, when they and their mothers were supplied with artificial fodder) grazed on the natural pastures, were shorn. It was then found that the lambs which had been fed, although of a younger average age than those which had been with their mothers, cut more wool. The respective weights were not kept separate, but the difference was quite appreciable, amounting to probably 3 oz. per head, the average clip obtained from all the lambs being 1½ lb. per head.

Quite recently it became necessary to truck some 5,000 ewes, with their lambs, some 200 miles, and as the ewes had only finished lambing some few days before being trucked, some of the lambs lost their mothers in transit; these lambs were, after being untrucked at the completion of their train journey, carted by motor lorry for 30 miles and then fed in the same way as the 511 previously referred to, and although, as was inevitable considering their exhausted condition, some losses occurred, these ceased almost entirely after the lambs had been on the feed for a week, and they are all now thriving well, and as was the case with the first mob, the wool appears to be growing faster upon them than upon the balance of the lambs of the same mob, which have been with their mothers all the time. However, it is still too early to say definitely that such is the case.

The results obtained from these experiments would therefore appear to indicate that the nourishment received by the lamb from its mother's milk is productive of fat rather than wool.

I understand from Professor Brailsford Robertson, who is in charge of the Division of Animal Nutrition for the Council for Scientific and Industrial Research, that their investigations appear to emphasise the importance of the presence of cystine in rather large quantities in the food of sheep for wool production, and that whilst the milk of ewes is exceptionally deficient in cystine, this element is present in better quantities in the proteins of wheat bran, maize, and lucerne hay, so that it would appear that lambs fed on well-balanced rations including these fodders would grow more wool than those running with their mothers and drawing the greater portion of their sustenance from their mothers' milk.

Favourable Effect of Feeding on Growth of Wool.

One outstanding feature of our feeding operations during the past drought, or at least since we adopted the feeding on mixed fodder in troughs, has been the pleasing way in which the growth of wool continued throughout the period of feeding and its generally well-nourished condition. This has been so marked that upon handling the wool after being shorn it has been very difficult to believe that the sheep had been artificially fed, and that the wool was not grown under favourable natural conditions.

The Need for Scientific Research into Feeding Problems.

This is a factor which, it appears to me, must in future feeding operations be given the greatest consideration, and graziers, when faced with the necessity for feeding their flocks, must not only give very serious consideration to the question of what is the cheapest fodder upon which their sheep can be kept alive, but also to the question of what fodder will give the best ultimate return, and will produce the best results as far as the production of wool and lambs and the maintenance of the general health of the flock is concerned.

This is only one of the directions in which scientific investigation can and will benefit the grazing industry, and it is possible that the rendering of financial assistance to the furtherance of scientific investigation into the many problems affecting the pastoral industry is one of the best investments the grazier can make at the present time, and the one which is the most likely to be of benefit to the grazing industry in particular, and Australia as a whole. At the present time the future prosperity of Australia as a whole appears to a very great extent to be dependent upon the prosperity of the grazing industry, and the prosperity of that industry in the immediate future at least appears to depend entirely upon a reduction in the present outrageously high cost of production and an increase in the productiveness of our flocks, and in this latter direction it appears that we can confidently look to scientific research to assist us in the solving of many problems.

Too Much Salt in Licks.

It is quite evident that lick will be much more extensively used in Central and North Queensland in the future than was the case prior to the commencement of the present drought (I use the present tense advisedly in speaking of the drought, as over a very great proportion of the Central-West and Western districts the drought is as bad to-day as at any time during the past four years), and in this connection it appears to me that the prices of practically all proprietary licks at present on the market are unduly high, and also that their salt content is quite unnecessarily and possibly dangerously high.

There is to my mind not the slightest doubt but that the losses in sheep through the excessive consumption of salt during the present drought, and particularly during 1926, when a great many graziers were using licks and artificially feeding for the first time, and in many instances paying a ruinous price for their experience, were very great, as few graziers then realised that salt in excessive quantities is a deadly poison, and even where the sheep have not been actually killed by the excessive amount of salt consumed, in many instances a great deal of harm has been done to pregnant ewes as well as to those suckling lambs.

Scientific investigation points to the conclusion that the great deficiency in the natural pastures in both Central and Northern Queensland as stock fodder appears to be the absence of phosphoric acid in the necessary quantities to maintain the stock in a thriving condition, particularly during those periods following seasons of excessive rainfall, when the grass is both very rank and dry. It would therefore appear that the supply of phosphoric acid to the stock in comparatively large quantities should be one of the chief objects of any lick, and not the supply of excessive quantities of salt.

Linseed Meal to Make Licks Appetising.

We have for some considerable time past been experimenting with various salt licks, mostly prepared upon the place, and the chief difficulty with which we have had to contend has been to induce the sheep to consume the amount of phosphate which appears necessary to attain the best results, and for this reason it seems needful to add to the lick some element attractive to the sheep, and which will mix with the phosphate so thoroughly that the stock will be unable to pick it out by itself. The greatest success which has been achieved in this direction up to the present has been gained by the incorporation of a considerable quantity of linseed meal in the lick, and in this way a lick has been prepared which is sufficiently palatable to the sheep to induce them to consume relatively large quantities of phosphates. The formula in use for the preparation of this lick is as follows:—558 lb. ground rock phosphate; 184 lb. coarse salt; and 200 lb. linseed meal.

Even with this comparatively large proportion of linseed meal the sheep at first exhibit considerable reluctance to consume any reasonable quantity of the lick, and to overcome this reluctance the proportion of the linseed meal is increased by the addition of another 100 lb. to each mixing until the sheep have taken to the lick really well, after which the extra 100 lb. of linseed meal is discontinued.

A cheap and possibly effective substitute for the linseed meal might perhaps be a small quantity of molasses diluted with a sufficient quantity of water to enable it to be sprayed on to the salt and phosphate during the preparation of the lick, and our next experiment will probably be in this direction.

The cost of the above lick prepared on the place works out at about £14 10s. per ton with 200 lb. of linseed meal, or about £15 14s. with 300 lb. of meal. Without the meal, but with the addition of sufficient molasses to render the large quantity of phosphates palatable to the sheep, the cost would only be about £9 12s. per ton, whereas the cost of the various proprietary licks ranges from about £15 15s. to £17 10s. at the seaboard, and on top of that we have 467 miles of rail and 30 miles of road carriage to pay.

From the above it might appear rather strange that we have persevered with the use of linseed meal, considering the high cost of same, but the reason for this is that when artificial feeding was discontinued in March last we had a very large amount of this meal on our hands, and were unable to dispose of it except at a very considerable loss, which we did not feel disposed to do, hence the somewhat lavish use of it in the preparation of the lick without regard to its cost. We could increase the quantity of meal used and still have a cheaper article, and possibly a more effective one, than many of the proprietary licks.

The use of iodine in the preparation of licks may be necessary in certain districts, but it appears probable that where the sheep are consuming a reasonable quantity of crude salt this will sufficiently supplement the supply of iodine available for them.

PLATE 32.—"AN ENEMY HATH DONE THIS!" ANOTHER GOOD KILL!

Cochineal, Chelinidea, and Cactoblastis, natural enemies of the pest, have been widely distributed throughout the pear area, and admittedly a 95 per cent. control has been exercised on the fruiting of prickly-pear. The most pessimistic landholder in the pear area therefore must agree that by mechanical means the Prickly-pear Commission has made it possible to maintain clear areas free from pear, and by the introduction of cactus-destroying insects it has controlled the further spread of pear. On the other hand, it would not be unduly optimistic to contend that by the use of mechanical and biological agencies the prickly-pear is gradually and surely being forced back, and should no disease or parasite adversely affect the cactus-destroying insects within the next few years, the pear problem in Queensland will be solved.

THE DEVELOPMENT OF THE SHORTHORN.

PROBLEMS OF BREEDERS.

By W. F. McLAREN, Naemoor Estates, Scotland.*

There are great breeds of beef cattle other than the Shorthorn—as, for instance, the Polled Aberdeen-Angus, which for quality of beef in unrivalled, except by the cross Aberdeen-Angus Shorthorn, the Hereford, and others, which have improved vastly during the last few decades, but I think I will stand uncontradicted when I state that no single breed of cattle is so universal, so cosmopolitan, as the Shorthorn. He stands, *par excellence*, as the ''grader-up'' of the world's race of cattle. He has the three big ''Q's'' in his pedigree—*Quantity, Quality,* and *Quick Growth.*

This evolution of the Shorthorn from the big, raw-boned late maturing and coarse animal of the eighteenth century. to the mellow, smooth-fleshed, early maturing and symmetrical animal of the twentieth century, has not been an accidental or casual evolution, owing nothing to the hand and mind of man. On the contrary, the reins of the evolution have been in the hands of great and far-seeing men, men with great hearts and great minds not untouched with genius, and the imprint of their work has been as permanent and as important, if not so spectacular, as that of better-known figures in the history of our civilisation.

Now nothing is further from my mind than to suggest that science should not have a connection, and a close connection, with successful evolution in cattle-breeding as in other industries; indeed I am all in favour of enlisting the co-operation of science into all and every department of agricultural activity, but I *do* want to suggest that without the master mind of the cattle-breeder, without the inherent and instinctive knowledge of that master mind in the ethics of his subject, science in itself would have had little hand in equipping the world with the improved race of cattle which is the only monument to our great master breeders.

Financial Returns.

Of the problems which confront the Shorthorn breeder their name is legion. First and foremost there is the problem of £ s. d. Prices at the moment are far from remunerative for purebred pedigreed Shorthorns, except in very exceptional cases, and it cannot be too generally impressed upon the general public and the farming community that the earnest and capable breeder of pedigreed stock must necessarily get a greater return than mere commercial price. His capital outlay and his running expenses are heavy, and he cannot carry on indefinitely without some concrete return and recompense for his services.

One hears a lot these days of the endeavour to improve the standard of store cattle; one hears of meetings and conferences to abolish the use of ''scrub'' bulls, but so long as we have the type of farmer or breeder who grudges to pay the extra pound or two which will procure him a decent bull when he can get his cows in calf by purchasing the worst ''scrub'' in the market, so long will we have the ''runt'' cattle which are the bane of the grazier's and feeder's life.

I do not see at the moment how we *can* abolish the ''scrub'' bull, but I do see how essential it is in the interest of the cattle population of the world why the buyer should be educated up or encouraged to use, not the ''scrub'' which he can pick up at the cheapest price, but the good pedigreed bull with a record behind him which he can purchase at just a little more. Stock breeders, and especially those in the pedigreed ranks, are, as a rule, men with an ingrained love of cattle, whose chief delight is to breed something which will do not only themselves and their herds, but the breed, credit, and whose enthusiasm is amply rewarded by an occasional outstanding production, but it must be admitted that a predilection on the part of the farmer to place his average, or nearly average, production on a par with the ordinary ''scrub'' is the reverse of encouraging or remunerative.

Problem of Pedigree.

For many years what I might call *paper* pedigree had a tremendous vogue among Shorthorn breeders. If a female was a ''Lavender,'' or a ''Princess Royal,'' or a ''Crocus,'' or a ''Duchess of Gloucester,'' or a ''Clipper,'' or an ''Augusta,'' or one or other of the few lines of families which seemed to have captured the popular fancy, she would sell at a great price no matter what were her intrinsic qualities, but breeders seemed to forget that a pedigree descends through the male side as well as the female side, and that what has originally been a ''Lavender'' line, in later generations had been crossed with all sorts and conditions of bulls, whose influence may have been good or bad, but was certainly unknown to most and unconsidered by many.

* In the ''Pastoral Review'' for October (No. 10, Vol. XXXIX.).

There is, of course, quite a feasible explanation of this craze. It originated in some eminent and successful breeders of past generations sticking to one family name on the female side. If a cow was called "Butterfly," her daughter was "Butterfly 2nd," and her great-great-great-grand-daughter "Butterfly 50th," or something like that.

Females which had been in the hands of these eminent breeders, and had produced something outstanding, naturally acquired a reputation, and when they or their female descendants fell into the hands of other breeders they stuck to the family name, but unfortunately they could not, or did not, stick to the same class or type of stock bull, and often produced only inferior stock. Notwithstanding this a sort of glamour still surrounded the family name, but the vogue was the means of inflating prices and "boosting" rather middling cattle, to the prejudice of the breed and the disgust of inexperienced though enthusiastic breeders. Fortunately this state of affairs is quickly being remedied, and breeders are taking a much more sensible view in their choice of pedigree. Really great breeders of this country lay much greater stress upon good top crosses and general excellence in breeding than upon family name.

Problems of Type.

One cannot emphasise too much the importance of *type* in cattle-breeding, and especially in the breeding of beef Shorthorn cattle. The alpha and omega of breeding beef Shorthorns is to supply the largest possible portion of the world with its requirements in beef, and towards this end type in the general is of vastly greater importance than super-excellence in the particular. A herd of cows of one uniform type, with perhaps none of them very outstanding, makes a greater appeal to the true breeder than a herd with one or two cows of outstanding merit, the others being a mixture of all the types.

It is the type which tells in the long run. How often has one heard the remark, "Now, there is a good animal; he has lots of faults, but he is the *right type*"; and again, "he may be a good animal; he certainly hasn't many faults about him, but he is the *"wrong type."* Take two animals, each representative of the quoted remarks, and which of the two finds most favour? Other things being equal, the latter may gain some fleeting and transient success in the show ring, but in the herd the former scores nine times out of ten.

It is quite possible for an animal to be at the head of a class at a show—and perhaps rightly so—and yet be inferior in intrinsic qualities to others in the class. Such an animal may be approaching the nearly perfection in almost every respect, and yet hardly conform to that perfect type which every true breeder has in his mind's eye, but can hardly define in actual words. It is a matter of instinct almost, and that is one reason why the inexperienced or inexpert breeder may do himself and his herd irreparable harm in securing at great cost an animal which has been a prominent show winner, and without taking into consideration the essential question of type.

To some extent the question of markets must govern the question of type. At the present time there are two distinct standards of type which command attention in the beef Shorthorn world. There is the short-legged, short-coupled, square-built animal, carrying a wealth of flesh, evenly distributed, on moderately fine bones. He, generally speaking, responds quickly to good feeding, develops early, and is generally recognised as the standard bullock of Britain, the Argentine, the United States, and Canada. In Australia and South Africa, more especially in Australia, the demand hitherto has in the main been something rather different. They have been breeding longer, rangier animals, the idea being that some length of leg was required to enable the animal to travel long distances to water.

I have, however, of recent years seen reports of some of the more important Australian shows and sales, and from these and the evidence of some of our home breeders who have visited the country it seems certain that the Scotch type of Shorthorn is rapidly gaining in favour and ousting the Australian type.

The ablest breeder in the world cannot, consistently, breed nothing but the best; he is bound at times to produce something which is below standard, and at this point I should like to enter a plea for the more drastic use of the knife in eliminating these outsiders from the ranks of pedigree breeding. It takes a strong mind in a breeder to see in the bull calf bred by himself from stock that he considers of merit—a rag of a beast which is not fit to procreate his own species, but the castration of this calf before he reaches the breeding age is the fastest and cheapest road to raise the standard of Shorthorn cattle and to fix permanently the true type and character of the breed.

The same principle of course applies on the female side, but its observance is the more important on the male side, where the bull is half the herd.

FRUIT AND VEGETABLE STORAGE.

By DR. LAURENCE P. McGUIRE,* Physiologist, Banana Research Station, Imperial College of Tropical Agriculture.

INTRODUCTION.

Generalisations regarding the optimum conditions for the cold storage of food products are, to say the least, difficult even for fruits or vegetables of a single genus. So much depends on the particular species or variety, the pre-storage conditions of nutrition (soil and climate), the stage of ripeness attained at the time of harvesting, the duration of the particular storage temperature, the amount of ventilation, the composition of storage atmosphere—humidity and concentration of carbon dioxide and volatile auto-toxins.

It must be borne in mind that up to the present experimental storage trials with vegetables have, for the most part, been confined to those grown in the temperate zones. In the case of vegetables cultivated in the tropics, it will be by experiment, and experiment alone, that consistent successful transport from season to season may be expected. The present paper, culled from current literature, is submitted in the hope that it will provide prospective shippers with the rudimentary knowledge with which experimental shipment may be commenced. Experience gained in the course of smaller preliminary trials will later justify large-scale operations.

It will be seen that investigators in different parts of the world recommend different optimum temperatures for the same fruit; in the absence of definite knowledge as to the variety, which is frequently not specified, this information appears at first sight to perplex, rather than assist. The references are given so that in the event of unsatisfactory transport at one temperature the other temperatures may be resorted to in turn.

Lastly, many fruits may be held successfully over compartively long periods at ordinary temperatures; as a general rule, the average storage expectancy of these fruits may be increased by storage at lower temperatures. Refrigeration is recommended during transport firstly to reduce, to a minimum, wastage due to the activities of putrefactive organisms and fungal growth generally, and secondly to allow, if necessary, of further storage at the port of destination in the event of a glut of the same commodity from a different country of origin (c.f. citrus on the English market from South Africa, Palestine, Azores, Canary Islands, &c.). The advantage under such circumstances of being able to delay senescence for a further period will be readily conceded. A careful study of Trade Commissioners' reports, based on first-hand information as to the trend of the market, would be helpful in this connection.

A.—VEGETABLES.

By way of introducing this aspect of the subject, reference will be made to the work at Norrköping, Sweden, of Lorenz Rasmusson[33], who carried out storage trials on a number of Swedish vegetables; after this, individual vegetables will be dealt with. He claims that in the case of Swedish Cauliflowers, Leeks, Red Cabbages, Brussel Sprouts, Artichokes, Jerusalem Artichokes, Beetroots, Horse-radish, Celery, Parsnips, Cabbages, Carrots, Sweet Marjoram, Thyme, Parsley, Dill and Turnip Cabbages, he has increased the length of storage life to an extent varying from four to nine months, and in the case of Salad, Spinach, and Tomatoes to two months. Krause[22] observes further that (1) Cauliflowers should be stored perfectly dry, otherwise they soon assume a greyish-white appearance and become covered with black sooty spots, which diminish their value considerably; (2) Artichokes, Celery, Parsnips, Beetroot, and Horse-radish kept best in dry sand† and in premises without light; (3) Marjolaine, Thyme, Fennel, and Parsley are inclined to lose their flavour in open crates. Zinc cans were found highly suitable.

All these vegetables were kept at a storage temperature of 32 to 33.5 deg. Fahr., and humidity 70 to 80 per cent. Generally speaking, vegetables should be packed in latticed crates in such a way as to ensure adequate ventilation, vitiated air being removed by periodically opening the storage doors for a short while.

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* In "Tropical Agriculture" (Trinidad B.W.I), October, Vol. VI., No. 10.

† For the purposes of transport dry packing material would be substituted for sand.

Tomatoes.

This commodity presents difficulties in storage, and advice as to the optima conditions of such storage must, of necessity, be guarded, owing to the considerable variation in keeping quality.

Rasmusson[33] (Norrköping) kept tomatoes for two months at 32 deg. Fahr.; Plank[31] and [23], of Karlsruhe, kept them for thirty-four days at the same temperature, remarking that on the fourth day after removal from storage deterioration due to mould formation was considerable.

According to D. B. Adam,[1] with tomatoes picked when three-quarters ripe and stored at 33 to 34 deg. Fahr. in ventilated chambers where humidity is relatively low, the average storage expectancy of seven to ten days may be lengthened to three weeks.

On the other hand, Barker,[3] of the Low Temperature Station, Cambridge, experimenting with both green and fully coloured tomatoes, is of opinion that the extension of the ripening and senescence of the tomato to any considerable extent by cold storage is not feasible. The experiments, which are by no means complete, suggest that the optimum storage temperature lies in the neighbourhood of 55 to 60 deg. Fahr. Storage at 34 deg. Fahr. might be recommended for the preservation of tomatoes as provisions for ships, where consumption would take place shortly after removal from storage.

H. C. Diehl[11] reports that experiments conducted with small lots of Acme, Globe, and Stone varieties gave results which indicated that such tomatoes were not injured when held for one day at 30 to 31 deg. Fahr. When subsequently stored at 50 deg. Fahr. for nine days they ripened very gradually, and if then held at room temperatures of about 70 deg. Fahr. they matured normally in five to seven days—a storage life of about fifteen days. (Tomatoes of the same stage of development, held at 32 deg. Fahr. for periods varying from fourteen to thirty days, failed to ripen, and quickly broke down at room temperatures.) If this procedure is adopted in transport, the preliminary cooling at 31 deg. Fahr. should be carried out in the Harbour pre-cooling station, after which the crates should be quickly conveyed to the boat chamber kept at a temperature of 50 deg. Fahr.

In harvesting tomatoes a small portion of the stem should be left on the fruit, and, furthermore, the use of individual wrappers for the fruit, which have been shown to retard the ripening process perceptibly, should be encouraged.

It should be clear from the foregoing that different varieties require different sets of conditions, which will be determined in the course of experiment only.

Onions and Garlic.

Experimental work at Norrköping[34] (Sweden) shows that at temperatures of about 30.5 deg. Fahr. onion tissue is altered by putrefaction, mould, and germination. On the other hand, very low temperatures—19.5 to 23 deg. Fahr.—kills the tissue and coagulates the albumen, which, after thawing, remains denatured. At 27 deg. Fahr. the tissue remains unaltered, and on removal to higher temperatures is similar to that of fresh onion, chemical analyses supporting the view. Cultivated Garlic may be kept at 21 deg. Fahr. without danger; nevertheless 27 deg. Fahr. is quite adequate for satisfactory preservation. V. R. Boswell[5] studied the behaviour of onions during, and subsequent to, storage at 32, 40, and 50 deg. Fahr., and found the lowest temperature most suitable. Furthermore, onion plants from the bulbs stored for eight months at 32 deg. Fahr. showed extraordinarily vigorous leaf growth.

For the purposes of a short voyage of fourteen days Onions, Garlic, Leeks, and possibly other members of the same family—viz., Spring Onions and Eschalots—could be safely carried at 32 deg. Fahr.

Potatoes.

Keeping potatoes at a temperature of 32 deg. Fahr for long periods (four months) helps sugar aggregation, since at this temperature respiration is slower than saccharification. Even at 36.5 deg. Fahr. sugar aggregation is noticeable in the slightly sweetened taste if the potato has been kept for any length of time at that temperature. From this point of view storage at 37 to 41 deg. Fahr. is advisable.[40]

Stuart *et al.*[37] observe that the range for complete dormancy of bulk-stored potatoes is between 36 and 40 deg. Fahr., and for normal potato storage a room temperature of 37 deg. Fahr. is apparently sufficiently low to prevent germination, at the same time insuring as low a transpiration and respiration loss as is desirable.

Storage of potatoes (1) at 35 to 37 deg. Fahr. eliminates storage rots[13] among seed potatoes, and (2) at 36 to 40 deg. Fahr. for fifteen days kills the caterpillars, pupæ, and eggs of the potato moth (*Phthorimœa opercullela* Zell.). It is further to be noted that the germinating power of seed potatoes kept at cold temperatures for as long as six months is not impaired at all, such seeds giving rise to a more uniform crop of sturdier plants. This view is supported by Etheridge[12] and co-workers of the Missouri Station.

As a result of his study of the relation between the storage temperature and the incidence and spread of storage dry-rot, Morris[27] advises holding potatoes in well-ventilated rooms maintained at 35 to 40 deg. Fahr.

Kimbrough,[21] having measured the initial rate of respiration when potatoes are removed from storage at different temperatures, found 40 deg. Fahr. to be the most suitable.

The concensus of opinion, then, favours storing potatoes at approximately 40 deg. Fahr.

Sweet Potatoes.

J. I. Lauritzen,[24] working on the temperature and humidity relation of black rot in sweet potatoes in storage, claims that at temperatures of 43 to 50 deg. Fahr. and humidity below 90 per cent. it is believed possible to eliminate, almost entirely, the incidence and spread of this disease. Thompson[38] reports that when sweet potatoes are thoroughly dried or cured the temperature for long storage should be maintained at as near 55 deg. Fahr. as possible, Crider and Albert[7] advancing a similar recommendation. Sweet potatoes, then, should carry favourably at 50 to 55 deg. Fahr.

Carrots.

Carrots were kept twenty-two weeks at 32 to 35 deg. Fahr and 39 to 40 deg. Fahr., losing 7 per cent. and 26 per cent. of their weight respectively. Hasselbring[15] observes that the hydrolysis of sucrose into reducing sugars was more rapid at the higher temperature. As the flavour is correlated with the sucrose content the lower temperature is recommended—viz., 32 to 35 deg. Fahr. Lauritzen[25] has shown that at such temperatures infection and decay, due to black-rot disease, are reduced to a minimum.

Celery.

Care should be taken to pack in dry material[22] and to ensure ample ventilation. A temperature of 31.5 to 32 deg. Fahr. has been found most suitable.[42]

Asparagus.

Plank's[31] investigations at the Institute of Refrigeration, Karlsruhe, indicate that asparagus in baskets may be kept approximately three to four weeks at a temperature of 32 to 35.5 deg. Fahr. and humidity 80 per cent. Bisson, Jones, and Robbins[4] recommend that asparagus should be stored as quickly as possible after harvesting in chambers at slightly above 32 deg. Fahr.

French Beans.

Scarlet runner beans[23] were held with favourable results in loose heaps for three weeks at a temperature of 32 to 38 deg. Fahr and humidity 85 per cent. They lost 20 per cent. of their weight in this period of storage.

Parsnips.

Boswell,[6] studying the parsnip from the point of view of changes in quality and chemical composition during storage, found that roots may be rapidly brought to a state of high table quality by storage at 32 to 34 deg. Fahr, the hydrolysis of starch and other polysaccharides, with consequent accumulation of sucrose, proceeding much more rapidly than at ordinary temperatures. The commercial value of this product is enhanced by holding at a temperature of 32 to 34 deg. Fahr. for three weeks.

Squashes.

Squashes may be conveniently kept for long periods at 50 to 55 deg. Fahr.; at temperatures higher than this squashes undergo a great loss of weight. Cummings and Jenkins[8] point out that squashes kept at 74 deg. Fahr lost 63 per cent. of their

weight in five months, while a comparable lot held at 55 deg. Fahr. for the same period lost only 20.1 per cent. In a storage test of squashes and pumpkins the mammoth cheese pumpkin kept in good condition for seventeen months. A storage temperature of 50 to 55 deg. Fahr. seems adequate.

Topepos.

Topepos have been kept unrefrigerated, and only towards the end of a period of eighteen days was a slight inclination to shrivelling noticeable. On maturing, the orange colour turned to deep red. Experimental transport might be commenced at temperatures in the neighbourhood of 50 deg. Fahr.

B.—FRUITS.

Citrus Fruits.

Citrus fruits, generally speaking, should present no difficulty to the shipper in the matter of a fourteen-day journey. Ocean transportation studies indicate that if pre-cooled to 50 deg. Fahr. citrus fruits may be shipped from Porto Rico[26] to New York in the ventilated holds of non-refrigerated ships, the temperature not rising much above 60 deg. Fahr. Citrus fruits (Grape-fruit, Oranges, Tangerines, Mandarins, &c.) are exported from South Africa at 38 to 40 deg. Fahr.

Grape-Fruit.

Hawkins and Barger[16] have shown that cold storage of grape-fruit is commercially practicable. Records show that for fruit to be held for six weeks in storage, pre-curing by exposure to from 70 to 75 deg. Fahr. at a humidity of 65 per cent., or by exposure to the gases generated in the incomplete combustion of kerosene stoves, reduced skin-pitting injury. The latter treatment is superior in being beneficial also in the loosening of the stem buttons, the absence of which tended to reduce disease infection in the fruit. These authors further point out that fruit picked early in the season can be readily stored for six weeks to two months at 32 deg. Fahr.

Oranges.

The investigations of D. B. Adam[2] with Washington Navel and Valencia oranges indicated that 34 deg. Fahr. is the most favourable storage temperature, taking into consideration both keeping quality and freedom from spotting. G. B. Tindale[39] considers 37 deg. Fahr. to be the most suitable temperature for Valencia late oranges, as a fluctuation of three degrees either way would not be attended with harmful results.

Lemons.

As a result of curing and storage tests of lemons at Gosford, W. B. Stokes[36] concludes that lemons harvested green may be held successfully in a well-protected storeroom for several months at a temperature of 70 deg. Fahr. or below, and relative humidity 80 to 85 per cent. Read[35] further supports the view that with careful handling, picking, curing, &c., lemons may be kept in ordinary cool storage for six months in excellent condition. For the purposes of short transport, then, refrigeration, in the ordinary sense, seems unnecessary.

Limes.

When picked fully grown but still quite green limes last comparatively well in ordinary cool storage—shipments of this fruit from Trinidad at temperatures in the neighbourhood of 45 deg. Fahr. have, on arrival at market, been favourably commented upon.

At temperatures of approximately 38 to 40 deg. Fahr.—the South African practice—or more widely 35 to 45 deg. Fahr.—the transport of citrus fruits should prove successful.

Mangoes.

Higgins and Punzalan,[19] from experimental storage of varieties of mangoes at temperatures of 36, 40, and 50 deg. Fahr., state that sound, green, but fully matured mangoes may be kept in satisfactory condition for eighteen to thirty days at 36 deg. Fahr.; at 40 deg. Fahr. fungus injury was prevalent, and at 50 deg. Fahr. shrivelling and decay soon occurred.

Pineapples.

While individual cases of pineapples sent home in the ship's provision room have reached their destination in good condition, this is by no means the rule. Experience has shown clearly that pineapples cannot endure low temperatures, on removal from which they rapidly break down—a view supported by Davies.[9] Studies at the Porto Rico Station[26] show that exposure to 35 to 40 deg. Fahr. will stop maturity changes considerably, whether fruits are green or mature—storage at this temperature for six days did not interfere with proper ripening, subsequent to removal from the store. Transport at 43 to 45 deg. Fahr., with adequate ventilation, is recommended.

Grapes.

Malaga (South African) grapes, harvested in late March and early April and packed in boxes with sulphite tissue paper and wood-wool, were kept at 32 to 33 deg. Fahr. for five months in excellent condition. De Castella[10] further confirms the view that 33 deg. Fahr. is the most suitable temperature for the transport of grapes.

Melons and Cantaloups.

Uurbina,[41] in an article on the transport of melons from Chili, is of the opinion that 32 to 34 deg. Fahr. is the best temperature for the preservation of melons in excellent condition. He stresses the importance of (1) careful handling to obviate mechanical injury, and (2) adequate ventilation, and recommends that the storage compartments be loaded to two-thirds of their height. With suitable "dunnage" between crates and adequate circulation of the air, this precaution may reasonably be omitted. For short journeys Californian cantaloups are carried at 40 deg. Fahr.

Pomegranates.

On account of the texture of the skin, this fruit will withstand a deal of abuse. After harvesting, the fruits, which should be clipped rather than pulled, will keep for months if stored in a cool, dry place. Although the bright lustre of the fruit is lost and the fruit shrivels somewhat, the flavour is not impaired in any way. Hodgson[20] further observes: "On account of the common habit of splitting, the fruit of most varieties must be picked before fully mature. Fortunately, the pomegranate is one of those fruits which, after reaching a degree of maturity, continues to ripen in cold storage, where it will keep in excellent condition for five to six months. Not only does it ripen, but the quality is improved, the flavour becoming richer and more vinous."

This commodity, then, should present no difficulty to the shipper.

Papaws.

Careful packing is absolutely essential in the transport of papaws. J. E. Higgins,[18] of the Hawaii Experimental Station, reports:—"The use of crimped strawboard as an exterior wrapper to go about each fruit in addition to the paper wrapper (glazed) is recommended. This provides a very valuable elastic cushion, against which the fruit rests, and which saves the fruit much bruising. . . . Refrigeration can be recommended for the shipping of papaias. No deterioration in the flavour of the fruit could be detected after it had been in refrigeration throughout the voyage to San Francisco, nor were there any other evil effects apparent."

An experimental shipment at 38 to 40 deg. Fahr. of a few cases from South Africa to the London market (about twenty-four days altogether in transit) suggests that the West Indian papaws, in view of their proximity to the market, might be exported with success at this temperature.

Avocado Pears.

Overholser[29] reports as follows:—"40 deg. Fahr. proved to be satisfactory for all varieties tested, except the Fuerte, which required 45 deg. Fahr. to prevent blackening of the skin. It was found that quick storage after harvesting, and care in handling, aided in keeping the fruits in satisfactory condition. Fruits picked just before the commencement of softening kept best and attained excellent quality. In proper storage the Dickinson, Royal, Taft, and Queen varieties kept for approximately two months; Spinks, Sharpless, and Challenge, five to six weeks; Rey Fuerte and Kist, for about four week." Several varieties[28] gave indication that they might be kept without injury at a temperature of 32 to 35.6 deg. Fahr.

Litchis.

At the Hawaii Experiment Station[17] it was found that "Refrigeration, where it is available, furnishes the best means of preserving the litchi for a limited period in its natural state." Unfortunately, no actual temperatures are given, but it is to be remembered that the fresh fruits keep quite well at ordinary temperature for two to three weeks without deteriorating in flavour, although the attractive red colour of the fruit is lost. Refrigerated fruit, on the other hand, showed no loss in colour or flavour during storage for a fortnight. Experimental shipment might be commenced with temperatures in the neighbourhood of 40 to 45 deg. Fahr.

Jujubes (*Zizyphus* spp).

According to Popenoe[32] no weather appears too hot for its cultivation, and it has withstood, without perceptible injury, a temperature as low as 13 deg. Fahr. In storage trials conducted by Overholse[30] jujubes have been kept at 32 deg. Fahr. in open containers for forty-five days, and remained marketable for five days after removal. The chief difficulty encountered was the cracking of the skin and wilting. In closed containers, at 32 deg. Fahr., cracking and wilting were lessened, and the fruits kept for eighty-five days.

The Kaki or Japanese Persimmon.

According to storage trials at the California Experimental Station,[30] Persimmons (Japanese) were held at a temperature of 32 deg. Fahr. for two months—upon removal from storage they remained marketable for a period of eight days.

Nuts.

Walnuts, almonds, and pecans have been held, both shelled and unshelled, for periods of four years in cold storage, with only slight deterioration in the flavour. Storage at 32 deg. Fahr. gave the best results, the depredations of worms[22]—a major evil of these commodities in storage—being successfully held in check.

Bananas.

Bananas of the Gros Michel variety are carried in well-ventilated holds at a temperature of 53 to 54 deg. Fahr. On arrival at their destination they are conveyed to ripening rooms of high humidity (90 per cent.) and a temperature between 70 to 80 deg. Fahr., according to the rapidity with which they are to be ripened to meet the market demand for ripe fruit.

Figs.

According to the "Revista Commerciale Itala-Americana," a new method of treatment[43] is being applied—the figs are immersed twice in a preparation with a paraffin basis (for large quantities a rolling carpet machine is used). In this way a rigid envelope is formed around the fruit, which prevents loss of aroma by evaporation. The paraffin substance is quite inoffensive and is removed with the peel—there seems, therefore, no objection from the hygienic point of view. In this way a delicate and highly perishable product may be put on the market in excellent condition, despite long journeys.

Good results have been obtained with figs stored at 32 to 34 deg. Fahr.

CONCLUDING OBSERVATIONS.

I.—The storage temperature and the commercial storage life at these temperatures are given for a number of fruits and vegetables either indigenous to, or which may be grown in, the tropics.

II. The maximum and minimum temperatures for safe transport, which would be valuable to prospective shippers, are given in a few instances only, as, unfortunately, the shipment of vegetable food products of tropical origin over long distances has received comparatively little attention; accounts of storage trials give, as a general rule, little more than the commercial storage life of a commodity at one particular temperature; in transport, the storage chambers should be maintained at as near that temperature as possible. Experiment will later define the margin of safety.

III.—With cargoes which are to be carried at low temperatures (32 to 40 deg. Fahr.), pre-cooling of the fruit at the harbour cold store, immediately prior to shipment, is very strongly recommended.

IV.—In storage compartments, particularly where refrigeration is effected by exposure to cold brine pipes (stagnant cold air as opposed to the cold air blast system), the use of "dunnage"—thin strips of wood nailed on the crates—to allow of the passage of cold currents between successive tiers of crates has proved decidedly advantageous.

V.—Care in harvesting and packing, to avoid mechanical injury, is essential to consistent successful shipment. The determination of the optimum conditions of transport, by the often slow process of elimination of unfavourable conditions, has frequently been delayed unnecessarily, through failure to observe carefully this condition; for the purpose of experiment the use of material, other than carefully picked, unbruised, thoroughly sound specimens, cannot be deprecated too strongly.

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CLIMATOLOGICAL TABLE—NOVEMBER, 1929.

SUPPLIED BY THE COMMONWEALTH OF AUSTRALIA, METEOROLOGICAL BUREAU, BRISBANE.

Districts and Stations.	Atmospheric Pressure. Mean at 9 a.m.	Shade Temperature. Means. Max.	Means. Min.	Extremes. Max.	Date.	Min.	Date.	Rainfall. Total.	Wet Days.
Coastal.	In.	Deg.	Deg.	Deg.		Deg.		Points.	
Cooktown	29·88	88	76	95	27	65	5	106	3
Herberton	..	87	63	99	6	48	4	505	6
Rockhampton	29·88	91	69	102	4	62	3	315	7
Brisbane	29·88	84	64	100	25	54	8	125	10
Darling Downs.									
Dalby	29·85	89	61	104	24	49	7, 27	215	4
Stanthorpe	..	78	51	93	24	34	7	265	9
Toowoomba	..	82	56	96	24	45	7	199	7
Mid-interior.									
Georgetown	29·82	99	72	107	6	58	4	110	5
Longreach	29·79	99	70	112	24	63	28, 2	69	5
Mitchell	29·84	90	62	105	24	46	7	201	4
Western.									
Burketown	29·82	98	76	105	5, 28	68	4	82	2
Boulia	29·80	102	64	113	24	57	28	61	2
Thargomindah	29·81	91	67	106	3	59	28, 6, 7	115	3

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF NOVEMBER IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALL DURING 1929, AND 1928, FOR COMPARISON.

Divisions and Stations.	Average Rainfall. Nov.	No. of Years' Records.	Total Rainfall. Nov., 1929.	Nov., 1928.
North Coast.	In.		In.	In.
Atherton	2·07	28	4·22	5·54
Cairns	3·91	47	0·87	7·11
Cardwell	4·06	57	2·58	9·43
Cooktown	2·63	53	1·06	4·39
Herberton	2·50	42	5·05	5·15
Ingham	3·71	37	2·05	13·89
Innisfail	6·13	48	3·26	13·68
Mossman	3·99	16	5·04	13·51
Townsville	1·82	58	0·25	3·59
Central Coast.				
Ayr	1·70	42	0·20	3·96
Bowen	1·31	58	0	3·49
Charters Towers ..	1·49	47	0·99	5·04
Mackay	2·98	58	0·51	10·75
Proserpine	2·87	26	0·31	6·53
St. Lawrence	2·28	58	0·64	5·29
South Coast.				
Biggenden	2·66	30	5·15	2·03
Bundaberg	2·50	46	2·38	1·49
Brisbane	3·71	78	1·25	2·90
Caboolture	3·34	42	1·67	1·73
Childers	2·65	34	3·93	1·51
Crohamhurst ..	4·28	36	3·44	0·91
Esk	3·20	42	2·32	1·68
Gayndah	2·82	58	2·52	1·93
Gympie	3·11	59	2·49	1·38
Kilkivan	2·52	50	3·32	1·38
Maryborough ..	3·06	57	4·26	0·91

Divisions and Stations.	Average Rainfall. Nov.	No. of Years' Records.	Total Rainfall. Nov., 1929.	Nov., 1928.
South Coast—continued:	In.		In.	In.
Nambour	3·77	33	2·52	0·64
Nanango	2·62	47	0·92	3·22
Rockhampton ..	2·17	42	3·15	1·70
Woodford	3·17	42	2·30	1·78
Darling Downs.				
Dalby	2·66	59	2·15	2·70
Emu Vale	2·62	33	1·74	1·09
Jimbour	2·37	41	1·29	3·99
Miles	2·39	44	0·73	2·25
Stanthorpe	2·72	56	2·65	1·73
Toowoomba ..	3·24	57	1·99	1·63
Warwick	2·59	64	1·48	2·02
Maranoa.				
Roma	2·66	55	1·33	1·52
State Farms, &c.				
Bungeworgorai ..	1·99	15	1·41	1·06
Gatton College ..	2·76	30	1·70	1·77
Gindie	2·67	20	0·60	2·65
Hermitage	2·63	23	1·16	1·30
Kairi	2·11	15	2·41	6·14
Mackay Sugar Experiment Station ..	2·66	32	0·90	6·87
Warren	2·96	14	..	4·17

GEORGE G. BOND, Divisional Meteorologist

RURAL LIFE IN OTHER LANDS—VIII.

By the EDITOR.*

LAND TENURE.

BEFORE continuing our consideration of some phases of rural life in other lands I should like to say something on forms of land tenure that exist and have a great influence on farming life in some of the countries of Europe, and of which one saw many examples in actual application.

The Scandinavian countries, and more particularly Denmark, show the most satisfactory results from their system of land tenure than any other of the older countries from what I was able to gather and as far as my knowledge goes.

Of course, we are now dealing with countries of well-established primary industries, thickly populated, with markets at every gate, and guided by many centuries of experience and tradition. And, though it is always worth while studying the systems whether of land tenure or of farming practice in the older countries, we remain conscious of the fact that, under an entirely different set of conditions as exist in Australia, they might not be so successful.

Systems of Land Occupation.

Before going into the details of the more or less identical Danish or Swedish systems and methods, and the results produced from them, it would be as well, perhaps, to survey rapidly the different systems of land occupation which have been tried, and still survive in one form or another, since man emerged from his wandering tribal days. I am using the word tenure in its general sense, with no legal or technical limitation. For example, where the majority of farmers own their farms, the system of tenure is occupying ownership. Where they rent the farms they occupy, they do so under the tenancy system, whether they rent their land from an individual or from the State. Where, as in some parts of Europe, the commune or local authority owns the land and allots it to its members, we have the communal system. And when the farmers, instead of working individual holdings, cultivate the soil collectively, then we have the communistic system of tenure. There are very few examples of the communistic system, however, and none that I know or have read of, outside religious orders, are very successful. Where a country or State owns the land on behalf of its people, we have a system of State ownership. The system of ownership by the commune and State ownership are closely related, but there is a vast difference between them and private occupying ownership.

Evolution of Land Ownership.

A study of the history and evolution of civilisation tells us that at one time, in the earliest ages, there was no ownership of land. Primitive man did not own land either collectively or individually, and probably did not want to own it. To him his country was nothing more than a hunting-ground, more or less happy according to the abundance of game and the risks he had to take in getting it.

Then, in the next stage, our forefathers in the long ago thought it would be a good idea to domesticate some of the animals they spent most of their time in hunting. They found it more convenient and certain to keep to-morrow's breakfast or next week's supplies tied up near their gunyas or tethered to a sapling just outside their cave, just as our own aboriginals in some parts of Australia are said to keep their next day's dinner—a crocodile, perhaps—tied up under the house. Sheep in a station ration paddock to-day is evidence of the survival of this custom.

Then followed the tribal system under which a tribe had a more or less right to certain areas over which its members hunted, and on which their stock grazed. Any encroachment by another tribe on their selection was promptly and forcibly resisted. This system survives to-day in Australia among aboriginal tribes who are still more or less beyond the range of European settlement.

As civilisation advanced, not only did these tribal areas become more clearly defined, but portions were allotted gradually to individual members of the tribe to cultivate. Land may have been cultivated collectively in some cases, but there is little evidence of this, and, in any case, that system was soon superseded by individual cultivation of plots allotted by the tribe or commune. As civilisation further developed, the desire of the individual to own the land he tilled became stronger and stronger, until to-day we see in all of the older civilised countries most of the land in the hands of private individuals.

* In a Radio Talk through 4QG.

Security of Tenure a Natural Desire.

To own the land one cultivates, or to have at least absolute security of tenure, seems to be a very general human instinct. We are all familiar with the evils that have grown up around the monopoly of land; we have seen, as in England during the past century, the control of vast areas of country concentrated in the hands of comparatively few people. So the tenancy system grew, and we know the efforts of British statesmen in recent times to mitigate some of the obvious evils that grew out of that system, and which still present a perplexing problem. In comparison, I should say the Scandinavian system of occupying ownership, as against the British system (changed somewhat, admittedly, in later years) of tenant farmers, is far better.

On the other hand, France gives examples of the ridiculous extremes to which the principle of occupying ownership can be carried. Small farming properties there have been so divided and subdivided until, in many cases, an unworkable unit is arrived at. In one extreme case a farmer (one could hardly call him a farmer on such an area) owned a strip of land, little broader than a single furrow, just a yard wide and half a mile long.

A Danish Example.

In Denmark these evils have been remedied or avoided; in districts where small holdings are the rule, no one individual is allowed to buy out his neighbours and turn an aggregation of small areas into one big farm. The influence of the old system of primogeniture—that is the succession to the land title by the first-born or eldest son—has also been against excessive subdivision.

About eighty years ago the land conditions in Denmark were similar to the rural conditions in other countries of Europe to-day, and the Danes discovered that there was something "rotten in the State of Denmark." Eighty years ago 88 per cent. of the occupiers of Danish farms were tenants of great landowners, and only 12 per cent. of the farmers owned the land they cultivated. The Government of the day realising that the tenancy system was against the best development of the land, and that it did not encourage high standards of cultivation, set about increasing the number of occupying owners. In this work the Government, oddly enough, received every assistance from the big landed proprietors, who saw the business in the idea from a national point of view. All sections worked to raise the standards of agriculture and the status of the agriculturist. To-day only twelve out of every hundred farmers in Denmark are tenants of a landlord. The other eighty-eight own their own land. And the result of this policy, carried out more scientifically and wisely than perhaps in any other country, is that we see in Denmark to-day a nation with a highly developed country life and prosperous rural industries. The country people there, too, enjoy a very high standard of rural education, and consequently there is no difficulty in securing united co-operative effort to still further develop agriculture in every direction

A Balance between Individualism and Collectivism.

In Denmark one sees the most perfect balance between individualism and collectivism, for the Dane as an individual is an active, virile, independent man, working on his own and for himself; yet he is sufficiently educated to understand that at a certain point collective action is necessary—not only for the good of the community, but to secure the full result of his efforts as an individual. In this attitude of mind, in the results of the balance of individualism and collectivism there are, if I may so suggest, some sound lessons for the Queensland farmer.

There is no standing still, or marking time, or waiting for the weather to break, or until after Christmas, about the Danish people. The area of the land under cultivation is being constantly and successfully extended; bog land has been drained and turned into rich productive soil; light sandy soil has been built up gradually and turned into excellent easily-worked land for small holdings. Yields have steadily increased, and the scientist is yoked up in double harness with the field worker, and with it all the Danish farmer has been able to provide a sound business organisation at the selling end of every crop.

Denmark remains the only example in the world of a country in which it is possible—and it has been done—for a working man to found an agricultural college.

The resourcefulness of the Danes is illustrated in another way. During the war her coal supplies from England on which she depended for light and fuel were cut off. To meet this situation the agricultural co-operative societies erected electrical plants to provide power, heat, and light to carry on their essential industries.

The whole history of Denmark is one of progress, and, in my opinion, the primary cause of that progress was the substitution of a system of occupying ownership for occupying tenancy.

SOOTY OR PITCHY MANGE IN PIGS.

E. J. SHELTON, H.D.A., Senior Instructor in Pig Raising.

Note his been made on several occasions recently of a form of skin disease in pigs, technically referred to as Sooty or Pitchy Mange and which, to the eye of the layman, resembles the condition illustrated in Plate 33 of a pig suffering from Sarcoptic Scab, another type of skin disease, much more serious in its effect on the animal and much more difficult to eradicate. Sooty or Pitchy Mange, according to Mr. C. J. Pound, Government Bacteriologist in Queensland, is frequently a symptom of internal disease of such a nature as to cause general ill-health and result in the skin and hair becoming hard, dry, scurfy, and altogether unhealthy.

It is impossible with the naked eye to definitely determine the real cause of these skin diseases, for the parasites responsible for these troubles are so minute. This disease is differentiated from true mange by the very intense itching, but with certainty only by the discovery of the parasites which is usually easy upon microscopic examination.

The diseases are sufficiently important and their effect on the animals so serious, that no effort should be spared to have the cause of an outbreak investigated, and in this connection farmers whose pigs are affected with skin diseases are invited to communicate with officers of the Department of Agriculture and Stock with a view to having the condition investigated.

The following treatment is likely to prove useful in both forms of Sooty or Pitchy Mange (i.e., where due either to parasitic infection or to internal trouble).

Cleanse the affected parts thoroughly by washing with warm, soapy water, to which some disinfectant solution has been added; then dry with a soft cloth and dress with a mixture composed of—

Raw linseed oil	1 quart.
Hycol disinfectant	1 teaspoonful.
Flowers of sulphur	4 oz.

Mix the flowers of sulphur with a small quantity of the oil first, then add balance of the oil and finally add the Hycol disinfectant, stirring the latter well into the mixture before applying to the skin. Repeat the application for several days and keep affected stock isolated from healthy animals and under improved hygienic conditions, feeding liberally on soft, nourishing foods, allowing ample supplies of clean drinking water, greenstuff, and mineral matters. The pens or yards in which the affected animals have been housed or fed should be thoroughly cleaned up and all rubbish and litter burned. The woodwork should be limewashed and/or disinfected, and kept clean and free from accumulations of mud and filth.

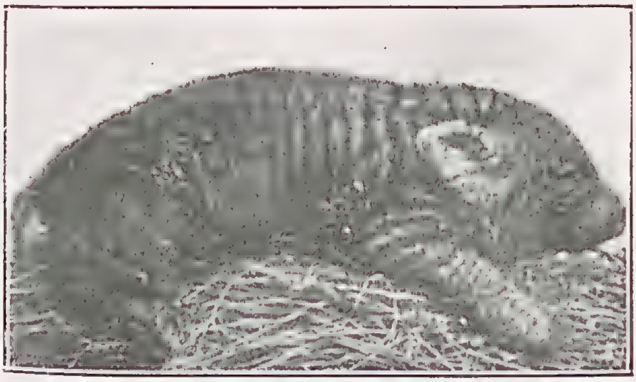

Plate 33.—Sarcoptic Scab in the Pig.

A disease of the skin causing the animal intense pain and irritation and affecting growth and appearance to such an extent as to render affected stock unmarketable and distinctly unprofitable. Pigs affected with Sooty or Pitchy Mange have a striking resemblance to the pig affected with Sarcoptic Scab.

OTHER FORMS OF MANGE IN PIGS.

*Mange Mites.

Mites belonging to two genera cause mange in swine, *Sarcoptes scabiei suis* and *Demodex folliculorum suis.* These parasites spend their entire life on the host and live on the blood and tissues of the animal they attack.

The body of the Sarcoptic mite is rounded above and flat below. Its size is about one-fiftieth to one-sixtieth of an inch. The thoracic and abdominal regions are more or less united, the epidermis is transversely striated, and bristles are present on the back. The mandibles are shaped like a crab's claw. They possess four pairs of short thick legs. In the male the hind legs are equal in length, suckers being present on the first two pairs of legs. The males are smaller than the females. If the mites are placed on a dark background they are just visible to the naked eye, but a lens or the low power of a microscope is necessary for identification.

The female mange mites burrow into the skin and lay eggs in the burrows. In from three to ten days the eggs hatch and the young mites, after moulting several times, begin to lay eggs in ten or twelve days. By this time they are near the surface, due to the normal shedding of the epidermis and to the rubbing of the infested animal. The young mites then make fresh burrows in the under surface of the skin and repeat the process. The irritation is severe, and the sensitive areas become inflamed and swollen. The swollen areas are larger than pinhads and have dried serum adhering to them. As the number of mange mites increase the raised areas become closer together, the hairs fall out, scabs are formed which rub off, and the serum oozes out and often a raw surface is left. Later the skin is corrugated, and in chronic cases wrinkles are left. If badly affected the animals become emanciated, and if left untreated will die.

Diagnosis consists in finding the mites by means of scraping the affected parts of the skin with a blunt-edged knife and examining the scrapings under a magnifying glass or by treating the scrapings with a hot 10 per cent. solution of caustic potash and examining under a microscope.

Sarcoptic mange is contagious and is generally spread directly by contact of one infested animal with another. Man may become infected and extreme irritation results for about thirty days, but the mites will not live much longer than that on another host. Crowding and unclean conditions predispose to the rapid spread of the disease. Weak, unthrifty animals are more prone to mange than healthy ones, and pigs fed upon a vitamin-deficient ration are very apt to suffer from this and many other diseases. The mites do not multiply after leaving an animal, but remain alive for two or three weeks or longer, and their eggs can survive for nearly as long under suitable conditions.

Pigs suffering from Sarcoptic mange should be treated with (1) crude petroleum, (2) cotton-seed oil and kerosene in equal parts, or (3) kerosene and lard, 1 half-pint of the oil to 1 lb. of the lard. These preparations may be applied with a brush or cloth and rubbed well in. Freshly treated pigs should not be allowed to become chilled, should not be moved rapidly, or subjected to strong sunshine. All litter should be destroyed by burning and the sty thoroughly disinfected before using for healthy pigs.

*Demodectic or Follicular Mange.

This is caused by a very small mite, *Demodex folliculorum suis.* It is wormlike in shape; the cephalo-thorax is followed by a transversely striated abdomen which gradually tapers towards the end. It is about one-hundredth of an inch in length; the male is smaller than the female. These parasites are found in the hair follicles and sebaceous glands of the skin, where the whole of the life cycle is completed. The parts of the pig's body most favoured by the parasites are the under parts of the head, neck, and abdomen and inside the thighs. The lesions often commence round the snout and the eyes and spread to the surrounding parts. The parasites are generally found in clusters and cause pustules, which often run together and form cavities and scales. If badly affected, pigs will become unthrifty, and septic sores and scabs on the animal appear and give an opportunity for bacteria to gain an entrance to the skin. The condition is not a very common one in swine, and is more serious in the dog; other animals affected may be cattle and goats. The best method of treatment for pigs affected by these parasites is the regular application of crude petroleum to the affected parts.

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*From an article on "Some External Parasites of Swine," by Mr. K. D. Downham in the "Pig Breeders' Annual," 1929-30, and reproduced also in "Q.A.J." October, 1929.

THE BATTLE OF THE BREEDS.

E. J. SHELTON, Senior Instructor in Pig Raising.*

Conditions in the live stock world in these twentieth century days are vastly different to those common during the eighteenth century and during earlier years when improvement in live stock really began, and when our forefathers took up in real earnest the domestication, selection, breeding, and development of the several types of live stock they were able to secure and control on a commercial basis.

Nowadays, it is quite a difficult contract to differentiate between the various breeds as to which is actually the most profitable, and quite as difficult to determine whether there is any one breed so much better than the others as to warrant it receiving special consideration when the question of selection of a breed is under review.

We speak of the battle of the breeds then as indicating the struggle for supremacy in which the various breeds are engaged. In the pig world in Australia we have nine different pure breeds of pigs, all of which are catered for and included in the herd-books of the Australian Stud Pig Breeders' Society.

These breeds are known by names which largely indicate their place of origin or the country or State in which they were originally developed and popularised, and comprise two principal groups, first the British breeds, and secondly those originating in America and coming to us through Canadian avenues.

The Berkshire.

Of British breeds the most widely distributed is the Berkshire, originating in Berkshire and adjacent counties in England, and now distributed throughout almost every country in the world. The Berkshire, black in colour with white points, is of a dual purpose nature, good alike for use in the production of pigs for the pork and bacon trade and for stud purposes. Standing at the head of the list in the Australian pig world, the Berkshire issues a challenge to all other breeds to be up and doing.

The Yorkshire.

The Yorkshire breed, of which we have two distinct types—the Large Yorkshire, or Large White, and the medium type known as the Middle York, or Middle White—is well known also, and has been popular in Australia ever since pig breeding first began. These White Yorkshire pigs have, however, in recent years in Queensland lost a good deal of their former popularity, and are not now so widely bred as they were a few years ago. This falling off in popular favour is not altogether due to any particular weakness in this class of pig, but is largely due to an inherited tendency in the breed to produce pigs which, while of excellent quality and capable of complete development, are, nevertheless, somewhat soft in the skin, and are subject to sunburn and sunscald unless they are carefully tended and given improved conditions in regard to housing and accommodation. The Large Yorkshire has not as yet (January, 1930) been introduced or popularised in Queensland, but it is quite certain that before very long enthusiastic fanciers of this type will have available for sale selected males and females of this very desirable breed. The Middle Yorkshire has been with us for many years, and was for quite a long time popularised and distributed by that grand old Berkshire-Yorkshire fancier, the late Mr. W. J. Warburton, popularly known as "Old Warby," of the Northgate Stud, Northgate Junction, a few miles outside Brisbane. Unfortunately, the original stud was dispersed on the death of its founder, though one or two of the sons still carry a few of these popular pigs. These breeds were originally also distributed largely through the efforts of that venerable and enthusiastic citizen, Mr. W. R. (or more frequently known as "Billy") Robinson, of Toowoomba, who has, through a long series of years, interested himself and many others in the gospel of "better pigs on every farm."

The Tamworth.

It is forty or more years since the Tamworth, the red pig of old England, was first introduced into this part of the world, and all through these years the breed has been spoken of as one of the best for crossbreeding with Berkshires and similar types for the production of prime quality, fleshy bacon. Originally developed and distributed from Tamworth, one of the midland counties of England, this red breed has, during recent years, had a very wide distribution throughout the world, and

* In a radio talk from 4QG.

though decidedly unpopular still with many of the old-time farmers, is gradually breaking new ground, and is becoming more popular as the years go by. We must thank the Chirnside family in Victoria, and the Hawkesbury Agricultural College in New South Wales, for the introduction of this type, and for the part they have played in periodically introducing fresh strains. The Tamworth's red colour distinguishes him from any of the other British breeds, and his suitability for the purpose for which he is kept stands almost unchallenged.

The Gloucester Old Spot.

It is but a dozen years or more since the Gloucester Old Spot—also spoken of as the G.O.S. breed—was introduced from Great Britain, the country of its origin. For many years this was the most popular local breed in Gloucestershire and adjacent counties in England, and was looked upon there as the ideal pig for general farm use. Its introduction into Australia in the care of Mr. A. E. Ball, now of Victoria, was arranged through the G.O.S. Pig Society of England, the objective being to widen the field and pave the way for a very liberal, though later, importation of this class of pig into the Commonwealth. The G.O.S. has had a very good run, it has become popular in all the States, and bids fair to become one of the most popular of all the breeds in this great Southern land. Black and white spotted in colour, and of a very growthy type, this old-world breed has a special appeal to all those who like big roomy stock capable of rapid development, early maturity, and an ability to put on large quantities of flesh with a minimum of feed and attention. The breed has a popular reputation both for pork and bacon production, and also for stud-breeding purposes, and has already proved in the show ring as well as in commercial pig keeping its ability to stand up to the conditions and make good progress. The Kingston Pig Farm Company have the largest stud of this breed in Queensland, and were among the first to have them introduced.

The Large Black.

Originally referred to as the British Large Black or the Old Devonshire breed, this old-world large black breed is whole black in colour, and has the long drooping ears characteristic of both this and the G.O.S. breeds. Long and deep in body and of a distinctly bacon type, the Large Black has been introduced specially for crossing with Berkshires, Poland-Chinas, Yorkshires, and similar breeds for the production of bacon pigs of a fleshy and desirable type. Popularised very largely in the first instance in New South Wales by Mr. Herbert Garrett, of the Loch Maree Stud then at Randwick, this breed has had a wide distribution, though during recent years the older strains have given place to more recently imported and more up-to-date types. The breed was recently introduced into Queensland through the generosity of Captain H. N. Callcott, of the Wattle Herd of Large Blacks at Gigarre, Victoria, who presented to the Queensland Schools Pig Club Scheme a very fine Large Black boar, since then the winner of many championships here, and the foundation sire of Mr. George Davison's stud at North Arm. The winning of this boar at a Pig Club Contest by Master George Davison led to the purchase for their stud of a very fine sow, Wattle Violet, a profitmaker of the very best type, and thus the breed has been introduced into this Northern portion of the Commonwealth. There are many fanciers of this roomy, deep-bodied type, and they have a good future before them.

The American Breeds.

The battle between the British and the American breeds is being waged in quite a businesslike way, for both sides are out to win, and both are prepared to spend both time and money in the struggle for first place.

Of American breeds we have but three, as against six of British origin, but there are several extremely enthusiastic breeders of the American types who count this no great hindrance to their progress.

The Poland-China.

The Poland-China, black in colour with white points, was the first of the American breeds to be introduced and distributed, and for many years this breed has forged ahead against the odds and has won considerable ground, their only disadvantage being that, unless very carefully handled, they are of a type that fattens rather too readily on the class of food largely used in pig-breeding activities in this State. The breed crosses remarkably well with the Tamworth, and doubtless in years to come a very great deal more will be heard of this popular cross than at present.

PLATE 34.—DOWN ON THE FARM.

A familiar scene on the farm where pig raising occupies the position its value and importance demands. These Yorkshire-Berkshire cross pigs are of a type much in demand by both pork butchers and bacon curers, and were healthy, well developed, and full of profit.

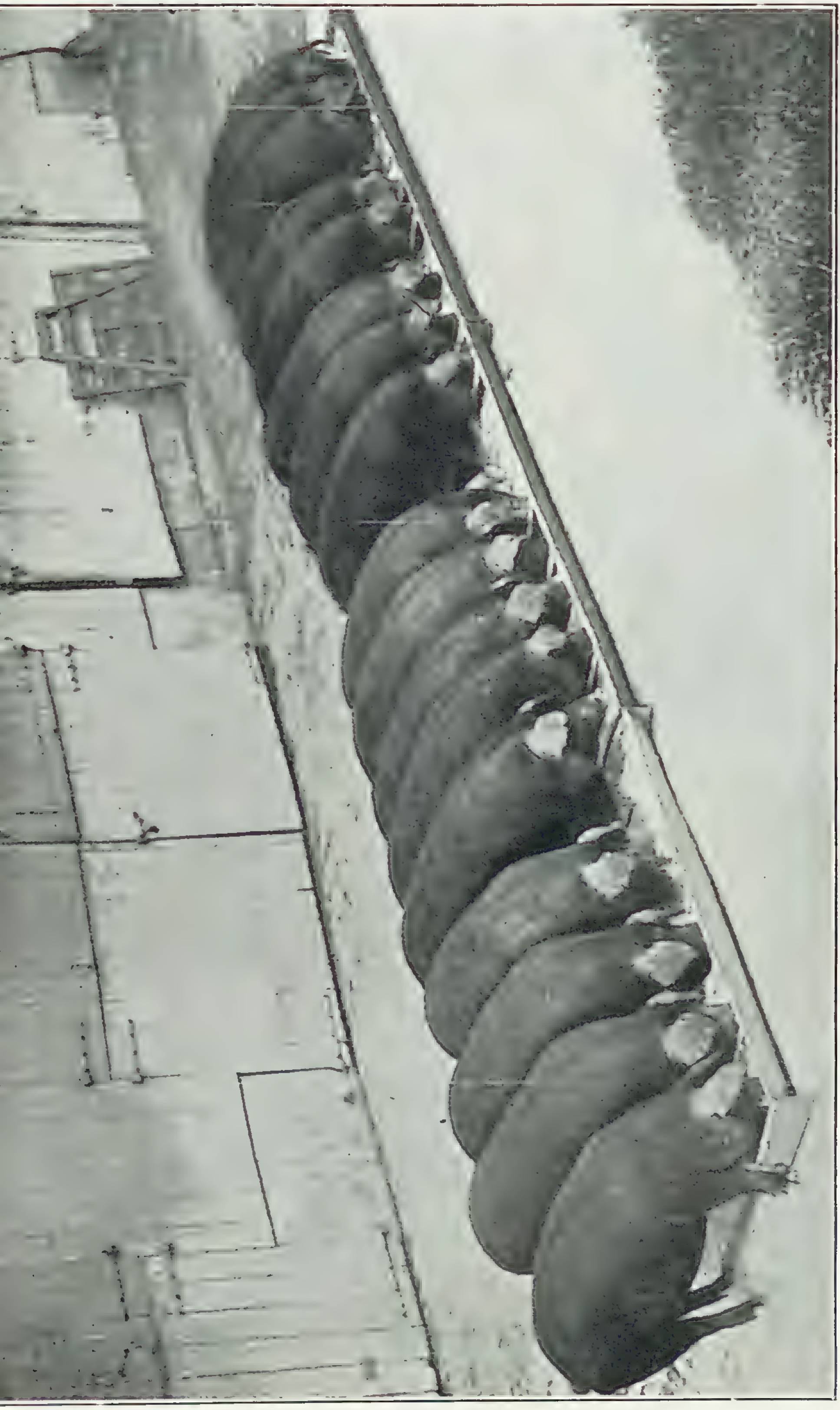

PLATE 35.—PIGS FOR PROFIT.

This is the litter that, in 1928, was classed as the World's Champion Litter of Duroc-Jersey Pigs—seventeen pigs in one litter weighing more than two tons when six months old. They were described as profit makers of the most up-to-date type. They were born and bred in the corn belt of the United States of America.

The Duroc-Jersey.

In the Duroc-Jersey, the red pig of American origin, we have a breed very similar in shape and appearance, but quite distinct in colour to the Poland-China, and a breed that has gained immense popularity during the comparatively short period it has had a place in our pig industry. Useful alike for crossbreeding for pork and bacon production and for stud-breeding purposes, these American breeds have taken a stand from which it will be difficult to shift them, and as they are already popular, it would appear they will be well worth watching as time goes on.

The Chester White.

More recently still another American breed—the Chester White—has been introduced and is taking its place for the purposes of crossbreeding, probably principally for bacon pig production, though they have a good reputation in the United States of America as a good all-round farmers' pig. This breed is distinctly white in colour, and also has small lopped or drooping ears, a characteristic familiar to all the American breeds we have so far introduced, though the ears are smaller than in the case of the Large Black and G.O.S.

PLATE 36.—A PRIME QUALITY BACON PIG OF DESIRABLE TYPE AND WEIGHT.

Queensland bacon factories pay top prices for prime quality baconers, 95 to 120 lb. dressed weight, and for such there is an ever-increasing demand.

It will be seen, therefore, that with nine excellent quality and well-recognised breeds of pigs, six of British and three of American origin, all competing together in the battle of the breeds, some interesting results may be looked for; while a considerable amount of publicity will be necessary to still further popularise all or any of these that show distinct evidences of superiority, and that are able to stand up to the competition better than others in this fight for commercial supremacy in the Australian pig world.

THE BABCOCK TEST OF PORK PRODUCTION.

Through the courtesy of Dr. John M. Evvard, the American authority on swine production, accorded to the Senior Instructor in Pig Raising, Mr. E. J. Shelton, we are able to publish the following outline of what he refers to as the Babcock Test of Pork Production, a story in which readers generally will be interested, whether they are engaged in the production of pigs or not. Dr. Evvard has written many interesting and informative reports, and though the figures refer to American conditions, they are equally applicable in their own way to conditions in Australia.—ED.

Speedy gains are the key to what we may call the "Babcock Test of Pork Production." You know all about the Babcock test for milk production—how the use of a simple outfit for determining butter-fat content has helped dairymen to cull out poor cows, and build up herds that, instead of yielding 300 lb. of butter-fat yearly, produce 700 to 1,000 lb.

My colleagues and I here at the Iowa Agricultural Experiment Station (United States of America) have been seeking an equally effective way of finding out how to select the most profitable pigs, just as the dairyman can readily know his best paying cows. I am going to tell you about this most practical discovery, which is so simple that we marvel it has been overlooked so long.

Since 1910 we have studied the productive efficiency of hundreds and hundreds of swine. We observed that the most profitable pigs were those that made the most rapid gains, with very few exceptions. We also found that if we wanted pigs to weigh 200 lb. and more at six months of age, we succeeded better when we selected breeding sows whose brothers, sisters, and sons and daughters, and other near relatives showed rapid gaining abilities. We also noted that if we used boars which came from rapidly-gaining strains, mating these with the rapidly-gaining strain of sows, the offspring weighed much more at six months of age than when we used sires and dams that came from slow-gaining blood lines. So here we have our clue. The rapid gainers were the most efficient for the breeding herd.

Our next step was to study thousands of swine to determine whether or not the feed requirements of the rapidly-gaining animals were less than those which reached marketable age slowly. We studied the records of a multitude of pigs from the time they were weaned at 40 lb. until they went to market at 225 lb. We learned that pigs which gained only ½ lb. per head between sunsets took approximately 486 lb. of feed for each hundredweight of gain. Pigs which gained 1 lb. per head daily took only 430 lb. of feed for the same weight of increase, or 56 lb. less for the 100 lb. of pork yield. That was gratifying.

We proceeded and found that pigs which put on 1.5 lb. daily took even less feed than the 1-lb. gainers, or only 374 lb., thus showing another decrease in feed requirements amounting to 56 lb.

The conclusion is evident; to get efficiency of production, to make a bushel of corn and other feeds yield the most in pork products and by-products, it is necessary to pick out "speedy" pigs which put on weight at a rapid clip. By speeding up the gain from 1 to 2 lb. per head daily, the feed requirement was cut 112 lb. on the hundredweight of gain attained. That is real economy.

In analysing our figures more closely we discovered that for every one-tenth of a pound of extra gain put on by the pigs we saved 11 to 12 lb. of feed per 100 lb. of pork made. And a tenth of a pound extra gain per head daily makes approximately 3 lb. more weight per month, some 18 lb. greater production in six months.

Forty-pound pigs that gain a pound daily take 185 days to reach the handy marketable weight of 225 lb. (as sought after in the United States of America), whereas the more efficient pen-mates which gain 1.1 lb. in the average twenty-four hours take only 168 days to reach the same marketing goal. Here we have a saving in time of seventeen days, and that is another advantage.

Thus by increasing the rapidity of gains we save feed, time, labour, overhead expense, and likewise we save even more by reducing the risk of sickness and death. Then, too, the pigs that reach the market weight the quickest usually sell for better prices, because the earlier markets for spring as well as fall (autumn) pigs are

higher than later ones. With a faster turnover you have money longer in the bank, and not so long in pigs. Hence, everything considered, it is a profitable proposition to produce pork with pigs which put on gains so quickly.

The profit for future years should be the greater when we apply in practice these facts presented herein and use for breeding stock those members of the herd which show the most speed in attaining the mature weight. By mating high-gainers with high-gainers the progeny are more efficient than if we follow the opposite procedure, and the resulting offspring should make more pounds of pork per bushel of corn and other feed fed.

It is profitable to follow the rigid policy of selecting only those individuals which come from rapidly-gaining strains for the breeding herd. If this practice is executed year after year, the swine herd should be placed upon a high plane of efficiency from the production and early marketing standpoints.

Some of my friends have been selecting for market the gilt (sow) pigs which have done the best, put on the most rapid gains. The temptation to do this is strong, because such pigs are usually ready to sell before the market prices begin to drop in the fall or late spring. Such procedure, however, takes from the herd the best individuals, thus handicapping future breeding progress.

It is common practice on the part of a great many to separate selected breeding gilts from the growing and fattening herd when they are four or five months old. If one does this, but finds later that the brothers and sisters of any selected gilts do not make acceptable gains in the market-fed group, it is wise to discard that particular gilt from the breeding-yards. We judge the future breeding efficiency of the gilt, not only by her performance but also by the development of her closest relatives. It is certainly true that "blood tells."

We are anxiously awaiting the day when thousands of our progressive swine-breeders will be producing 200-lb. pigs for market in four to five months.

THE EMPIRE PIG BUSINESS.

THE BRITISH MARKET.

The twelfth report of the Imperial Economic Committee, just issued, deals with pigs and pig products. It emphasises the great hold obtained on the main bacon market in the United Kingdom by foreign competitors who have concentrated on the production of a standardised type of pig and organised the trade in bacon on a national basis. Taste in pig products varies in different parts of Great Britain, but the report states that:—

"A general change is in progress in the prevailing taste. . . . A liking for smaller and leaner cuts in place of fat heavy joints was becoming apparent in England in the latter half of the last century. The lean type of bacon and ham, and the small cut of pork, are now firmly established as the predominent requirements throughout the South of England. In the Midlands the demand is for a somewhat fatter product and for sausages, pork pies, and "processed" meats, whilst further north still fatter products find a ready market."

In spite of these local differences the general preference for the lean type of bacon is growing. Danish farmers and bacon factories have concentrated on supplying this type.

Ninety years ago Great Britain was an exporter of pig meat, but to-day is dependent on imports for two-thirds of its supply. Nearly half the total imports, which altogether are valued at £55,000,000 a year, consists of bacon from Denmark, in which practically only one type of pig—evolved largely from the large White Yorkshire strain—is maintained. Payments are based on weight and quality grades, and all exports are subject to constant and strict inspection. The vast majority of pigs give dead-weight carcasses between 132 and 158 lb., lower prices being paid for carcasses outside this narrow range. Bacon so produced is marked in England as "Danish," and not under factory brands. It is all of the mild-cured type, and a very regular supply is maintained.

Dominion Supplies.

At present the whole of the overseas Empire contributes less than one-seventh of the total imports of pig products into the United Kingdom. Canada and the Irish Free State are the chief suppliers. Since the war New Zealand has been developing a very useful trade in frozen pork, both for sale as pork and for curing into bacon.

The consumption of pig products in the United Kingdom, though below those of Canada and the United States, has increased since the war by about 50 per cent. in weight and 100 per cent. in value, due almost wholly to larger imports of lard, bacon, and frozen pork. Foreign countries have received almost the whole benefit of this expansion.

Conditions of Competition.

The report emphasises the necessity for meeting consumers' tastes and of maintaining a regular supply. It contains a statement by representatives of both the bacon and pork trades of the characters to which the products should conform to meet the main market and of the breeds which yield carcasses of the requisite types. The report points out the great possibilities which exist within the Empire. It expresses the definite opinion that these possibilities are unlikely to be realised without organisation amongst the producers and the adoption by them and the curing industry of a joint common policy.

Research.

The report advocates that entry into the herd books should be dependent upon commercial performance and not only on show points. It advocates further research into the problems of nutrition generally, but states that—

> "from the point of view of the substitution of Empire products for those of foreign countries, perhaps the most fruitful line of research lies in the effort to make possible the carriage, without detriment, of mild-cured bacon from the Southern Dominions."

Preliminary experiments conducted at Cambridge on the freezing and cold storage of bacon are full of promise. They indicate that with certain modifications of present practice the problems of transport of mild-cured bacon from the Southern Dominions should be possible. The report strongly advocates that those experiments should be continued and developed with a view to testing their results in commercial practice.

Competitors Comparatively Few.

In spite of the large size of the import trade into Great Britain, supplies are drawn from comparatively few countries, the chief being Denmark, United States, Sweden, and Holland. The trade from the United States consists mainly in lard and hams, and it is possible that countries in the Empire producing large crops of maize might compete in that trade. The portions of the Empire in which the possibilities at present are most promising are the Irish Free State, Canada, Australia, New Zealand, and South Africa.

The report emphasises that regularity of supply is essential for a steady trade. "The idea that the top of the market can easily be caught by an 'in-and-out' policy is an illusion."

The committee envisaged "a great problem—nothing less than the replacement of the foreigner by the Empire farmer in the main supply of the standard article to the British market." For this standards of size and quality, adequate quantity, regular supply, and competitive prices are essential.

"The general effect of our report may be summed up in the words—the mobilisation of the producer. The benefits to the small farmer of a successful pig industry are so obvious as to justify, in our opinion, a great co-operative effort involving the farmers and traders of the Empire and, indeed, the Governments."

Answers to Correspondents.

PIG RAISING.

Replies selected from the outward mail of the Senior Instructor in Pig Raising, Mr. E. J. Shelton, H.D.A.:—

Rice Meal for Pigs—Cotton Seed.

D.B. (Ceratodus, Upper Burnett)—

1. Care must be exercised in using any meal or food to which pigs are not accustomed, and we think, in your initial practice in using rice meal, that if you add just sufficient salt to give the food a slight flavour, or molasses to sweeten the mixture slightly, you will soon accustom the stock to the rice meal. If you do not do this you will probably find the pigs refuse the food awhile before they become more accustomed to it. Where used judiciously in conjunction with green foods and foods carrying a high percentage of protein (pea meal, made from cowpeas or field peas, &c.) or green lucerne or even lucerne hay or lucerne chaff, good results may be looked for, though the general opinion of pig feeders is that the pollard is more palatable to pigs than rice meal.
2. Generally speaking, we consider cotton seed meal a risky food to use for pig feeding purposes, though this is not because it is not a good food as pig foods go, but solely because it needs to be used judiciously and with very much greater care than is ordinarily observed in the feeding of this class of stock. The pamphlet dealing with stock foods—a copy of which has been sent to you with several other pamphlets—deals with the use of this food for all classes of stock. The Supervisor of Dairying and the Poultry Instructor will advise on the use of cotton seed for calves and poultry respectively, and the pamphlets available on poultry and turkey raising have been forwarded. If you use cotton seed meal as a food for pigs it will need to be used in small quantities, not more than 10 per cent. for a start, and it should be soaked in and mixed in with other meals and with milk, for it is a comparatively expensive food that needs very careful handling.

Pneumonia in Pigs.

W.E.M. (Boyne Valley Line)—

It seems to us from your account that you have had some trouble with a form of contagious pneumonia among your pigs, a trouble all too common among young stock, and one that is extremely difficult to handle. Isolation of all sickly stock must be the first move in any condition indicating ill-health, after which special care and attention to the wants of these "off-colour sorts" must claim part of your time. Falling back on the good old castor oil will be effective in freshening up the sickly pigs, after which we believe tablespoonful doses of cod liver oil and some phosphates, bonemeal, and other mineral mixtures in the food must follow, the cod liver oil being given as a drench if this is possible or in a small quantity of warm food and a pinch of salt early in the morning. We believe a good oiling of the skin, using petroleum jelly or some other similar mixture, is just as good as internal medicine, for it seems that unless we can freshen up the "off-colour" stock and put them into better heart it is a difficult task getting them back on the right track.

It is difficult, even dangerous, to attempt drenching of a pig suffering from pneumonia, hence if the breathing is at all laboured or short and jerky, it is better to depend on using the oil in a form of a bran mash than as a drench, and, in all cases, a pinch of salt to take away the flavour of the oil and increase the thirst will be effective. Give ample supplies of clean drinking water and as much green food as is possible. Doubtless you have treated them for intestinal worms, for if worms are present in any number they cause distress and laboured breathing plus some pain. We note you have tried Nema capsules, and will await your further advice on results with interest. Flies are no doubt responsible for much of the trouble to which live stock are subject. Mosquitoes, too, cause trouble, and these, with intestinal parasites, give weak young stock a very bad spin. The symptoms you describe might be taken to indicate general ill-health, indigestion, and bowel disorders, plus a tendency to lung troubles. Why not open one up and let us have results of your post-mortem? Be careful

to incise all the glands, search for lung and intestinal worms and for kidney worms, and be especially careful to note if there is any inflammation of the stomach, intestines, and lungs. We cannot advise more than this without inspection, for it's no good spending money on the purchase of drugs if the seat of trouble is local or parasitic.

Ground Pumpkin Seed as Pig Feed.

R.C.L. (Proston, via Murgon)—

1. Ground pumpkin seed has the reputation of being particularly useful in the treatment of pigs suffering from intestinal worms, some breeders considering this product even more beneficial than turpentine or other drugs when used as a vermifuge (worm-expellent). We would not recommend ground pumpkin seed as a food for pigs unless mixed with other foods, and the Poultry Instructor (Mr. Rumball) informs us that he would not recommend them as a food for poultry at all, as poultry appear to be very susceptible to the poison these seeds contain. No doubt both pigs and poultry consume a proportion of seed when being fed on raw or cooked pumpkin from which the seed has not previously been extracted without ill-effect, but it would certainly be inadvisable to feed such seed unless with considerable caution, as an excess of highly concentrated seed matter might be responsible for derangement of the digestive system and for other ailments. If they are being used they should be mixed up with a liberal supply of other less-concentrated foods and be fed (with caution) in that form.

   Henry and Morrison in their book, "Feeds and Feeding," state that as pumpkin seeds contain much nutriment they should not be removed before feeding. They estimate that 1 ton of pumpkins, including seed, equals in feeding value for dairy cows about 333 to 400 lb. mixed hay or 800 lb. of corn silage. Though often cooked for pigs, trials show equally satisfactory results with raw pumpkins.

   Rommel, summarising the findings of three experiment stations, reports that 273 lb. of grain together with 376 lb. of raw pumpkins gave 100 lb. of gain with fattening pigs. When cooked it required 1,150 lb. of pumpkins and 222 lb. of grain for 100 lb. of gain. They also add that feeding an undue allowance of seeds would tend to cause digestive disturbances on account of their richness.

2. *Best class of pig for market.*—Extensive reference has been made to this subject in the pamphlet dealing with "Economic Phases of Pig Raising," of which a copy has been sent to you. From that publication and from others forwarded you will note that the principal demand in this State is for prime quality bacon pigs weighing from 95 to 120 lb. dressed weight (approximately 140 to 170 lb. live weight). The factories do not specify any particular breed or cross, but the pigs must be in prime condition, not too fat, and must be firm and able to stand up to the journey by train or other conveyance to the factory. A type similar to that produced from the Tamworth-Berkshire cross has given satisfaction, but pigs of other breeding give equally satisfactory results if they are well grown and developed and properly fed and handled.

To Rid Pigs of Lice—Hair Growth on Pigs.

H.H. (Kingston)—

1. To rid pigs of lice and other external parasites, prepare a mixture composed of ½ pint of benzine, ½ pint of kerosene, and 7 pints of fish or other cheap oil. Mix together thoroughly, store in a clean tin or jar, and apply per hand or per soft cloth or brush after the animals have been freed from accumulations of mud and dirt by washing. Repeat the application in three days' time, and then occasionally when it is noticed lice are about again. This will effectively deal with the lice and keep the skin soft and clean.

2. For encouraging the growth of hair on bare patches we recommend coconut oil, which may be purchased in bulk tins of 1 to 14 lb. at wholesale druggists. This oil is quite soft during summer months, but may require heating to soften during the winter time. It is a reliable preparation for encouraging rapid growth, and keeps the skin soft, free from scurf, and in mellow condition. Petroleum jelly may also be used in a similar way, and is also quite a good preparation.

General Notes.

New Sanctuaries for Native Fauna.

The State Forest Reserve (R. 452), portion 255, East Barron (Atherton), and the Reserve for Water and Gravel (R. 536), parish of Kalkie (Bundaberg), have been proclaimed sanctuaries under the Animals and Birds Acts. It shall be unlawful for any person to take or kill any animal or bird in these areas.

Standard Fruit Case.

The Fruit and Vegetable Grading and Packing Regulations of 1928, made under "*The Fruit and Vegetables Act of* 1927," have been amended by altering the dimensions of the Canadian standard case. The dimensions of that case now read—"Eighteen inches long by eleven and one-half inches wide by ten and one-half inches deep."

Queensland's Bread Needs.

"I find that the consumption of wheat in Queensland in the matter of the bread requirements of the people may be taken at approximately 5,000,000 bushels, exclusive of requirements for seed, poultry feed, and such like. Over a period of eleven years we have produced on the average barely half these requirements. A doubling of the wheat production of the State would mean an increase in the income of the State of close upon £750,000 per annum."—Hon. H. F. Walker, Minister for Agriculture.

An English View of Emigration.

"We transport criminals no longer; we emigrate the poor instead. Carelessness in choosing emigrants and in fostering their welfare when once they have left our shores has created in the public mind the firm conviction that what was once a punishment for crime has become a punishment for poverty. The spread of education no less than the increase in security at home, represented by the development of schemes of social insurance, has made men more and more reluctant to emigrate. Despite the unparalleled unemployment experienced since the war, the passing of the Empire Settlement Act of 1922, and the activities of the Overseas Settlement Committee, the number of emigrants has declined steadily since 1913. In the years 1911-13 240,000 workers on the average sought fame and fortune in the self-governing Dominions. In the years 1925-27 the average fell to 107,000. 'Training and After-care' must become the motto of the emigration authorities. They must offer emigrants the opportunity to equip themselves for the tasks of pioneering. They must offer emigrants sound prospects of winning a decent livelihood and of building up a decent home life; and one way to do that is to induce the Empire Government to protect their people by legislation in the same way as citizens are protected in the Home Country."—"Co-operative News."

Staff Changes and Appointments.

Messrs. G. Bell, R. C. Gilmour, J. I. Lomas, J. C. Schnitzerling, A. Clowes, and F. J. Kingsford, of the Warwick district, have been appointed Honorary Rangers under the Animals and Birds Acts for the sanctuary at Connolly Dam, Warwick.

The Police Magistrate at Blackall has been reappointed Government Representative on the Barcoo Dingo Board.

Sergeant C. J. Perrin, of Gladstone, has been appointed an Inspector of Slaughter-houses as from the 16th November, 1929.

Mr. T. E. Dwyer, Clerk of Petty Sessions, Mackay, has been appointed chairman of the Cattle Creek, North Eton, and Racecourse Local Sugar Cane Prices Boards for the 1929 sugar season, vice Mr. J. J. Scheibein, resigned.

Messrs. G. R. Passmore, A. B. Greer, and James Grindle, of Wacol, have been appointed Officers under the Animals and Birds Acts to prevent the shooting of native animals and birds in the Wacol district.

Mr. C. D. Hogan, Senior Clerk, Government Workshops, Ipswich road, Department of Public Works, has been seconded for duty as Senior Clerk (Accounts), Agricultural Bank, for a period of three months.

An Order in Council has been passed proclaiming the Goodna Recreation Reserve No. 359, county of Stanley, parish of Goodna, to be a Sanctuary for the protection and preservation of native animals and birds.

Foods that Taint Pork.

Recent inquiries indicate that the use of fish meal, fish oil, and whale oil as supplements in the feeding of pigs is to be strongly discouraged after the pigs reach the age at which they are usually penned up or otherwise prepared for the final fattening stages of development. Experiments are in progress in New Zealand and elsewhere aiming at determining up to what period before killing, fish meal, fish oils, &c., can be fed without tainting the carcass. That there is a certain amount of risk with all these oily foods, and with peanuts and soya beans, when fed to pigs in the fattening stages—*i.e.*, two months before slaughter—is well known to all authorities on pig feeding, though many farmers appear to be unaware of the risks involved. The matter is one that needs further investigation, and is a subject that might well be discussed at meetings of the pig industry committees and other bodies specially interested in the production and marketing of pork products.

Australian Beef Wins.

A cable message from London, 3rd December.—The result of the secret ballot on beef exhibits at Australia House, at which Mr. T. Trumble (Official Secretary at Australia House) presided, was as follows:—Australian beef, 364; Scottish, 354; Argentine, chilled, 348.

The guests each had a slice of each kind of beef, not knowing from which class it had been cut. The highest points went to beef cut from an Australian two-year-old Hereford.

Colonel Dunlop-Young, the City of London's chief veterinary surgeon, revealed that he had placed Australian beef first, saying that it was Scottish opinion of English-bred, but grown in Australia.

Resident Entomologist for Nambour.

Mr. H. F. Walker, Secretary for Agriculture and Stock, has announced that Mr. W. A. T. Summerville, Assistant Entomologist at the Head Office of the Department of Agriculture and Stock, will, in future, have his headquarters at Nambour. Mr. Walker states that this action is part of the policy of decentralisation to ensure as far as possible that certain technical officers of the Department shall be stationed in the centre of the districts in which their work will primarily lie.

Mr. Summerville entered the Public Service as a learner in the Entomological Section of the Department in 1922. In his spare time he studied at the Queensland University and secured his B.Sc. degree last April. Mr. Summerville has specialised in the diseases of citrus fruits, and it is chiefly for this reason that Nambour has been selected as his headquarters. There will be associated with him in the Blackall Range Mr. R. L. Prest, Instructor in Fruit Culture, whose speciality is also citrus fruits.

Both Mr. Prest and Mr. Summerville have a sound knowledge of horticulture and entomology respectively, and both are capable of advising fruitgrowers on cultural and plant disease matters generally.

Tourist Bureau—Opening of New Premises.

Recently the control of the Government Tourist Bureau was handed over to the Commissioner for Railways (Mr. J. W. Davidson) with a view to a more satisfactory handling of the tourist business, with which the railways are so closely identified.

Mr. Davidson decided upon a scheme of reorganisation, involving the bringing together of the tourist activities and the principal city railway booking office. He made certain rearrangements of the disposition of his staff which allowed of the major portion of the floor area of the Commissioner's Office in George street being converted into a tourist bureau and city booking office. Show windows for the display of photographs and publicity matter have been installed on the street frontage, and considerable interior alteration has been made to suit requirements.

The new booking office is open to the public for the purchase of tickets and reservation of seats and sleeping berths on interstate and Queensland mail trains, as well as for the sale of tickets for the South Coast line (Southport and beyond) from 9 a.m. to 5.30 p.m., Monday to Friday inclusive, and from 9 a.m. to noon on Saturday; outside the hours named bookings will be conducted at the ticket office on No. 1 platform, Central Station, but the issue of post-dated tickets and reservations from that office will be restricted to one week ahead, whereas booking will be made at the city office for twenty-eight days ahead as heretofore.

Tickets for special trips, including accommodation or meals, will be sold at the bureau booking office counter in the Tourist Bureau, which will be quite distinct from the railway booking office situated in the same building near Queen street.

Australian Wheat a Winner.

Thus a Press message from Chicago, 2nd December:—J. W. Eade, of Euchareena, New South Wales, won first place with White Spring wheat at the International Live Stock Exposition on Monday.

Running a Family.

Either to let the children grow as they will and do anything they please, or else to establish a benevolent but firm autocracy, is a simple way to run a family. Both these types of household, however, for purposes of training children, are as cheap as they are easy. The youths who are best fitted to be good citizens in the new generation come out of democratic homes. A child from the beginning ought to be called into the family's counsels and consulted on the family's affairs. A little child, if well handled, is the most loyal of creatures and would far rather than not be devoted to his group and co-operative in its interests..—Dr. Fosdick in "World To-day."

Prevention of Swine Fever.

The most recent literature dealing with diseases of the pig and kindred subjects indicates that to avert the risk of swine fever preventive measures are necessary. Following is a summary of the measures recommended:—

(1) Prohibition of the importation of pork or other pig products from any country except those that are declared free from swine fever, and the prohibition of the use of ship's garbage as pig feed.

(2) Prompt notification by each State of the occurrence of outbreaks of swine fever or suspected swine fever.

(3) Slaughter of all pigs on any holding on which swine fever occurs, and the destruction of carcasses of such pigs.

(4) Thorough boiling of all household refuse and garbage on the premises on which the pigs are being kept before such refuse or garbage is fed to the pigs.

(5) The introduction of a system of pig branding which would enable pigs to be more definitely traced within the State.

It has been noted further in regard to the spread of swine fever that next to the living infected animal the feeding of pork scraps in garbage is the most important means by which disease is spread.—From reports of an address by Mr. Max Henry, Chief Veterinary Surgeon of the Department of Agriculture of New South Wales, at a meeting of the Pig Industry Committee of New South Wales.

Levy on Stanthorpe Fruit and Vegetables.

Regulations have been issued under the Fruit Marketing Organisation Acts renewing for a further twelve months the levy on Stanthorpe fruit and vegetables.

This levy consists of 10d. per ton on all fruit and vegetables railed from all railway stations between Wallangarra and Dalveen (including all stations on the Amiens-Pikedale Branch). Where more than one grower contributes fruit or vegetables to any one consignment, the total amount of the levy payable will be paid in proportion by the different growers, there being a minimum of 1d. payable in respect of any one consignment by any grower who, in his name or otherwise, contributes any fruit or vegetables to such a consignment.

The extension of the levy has been made at the request of the Deciduous Sectional Group Committee, and has been endorsed by the Committee of Direction. The manner of making the levy is as follows:—

A resolution shall be passed by the Committee of Direction that the levy be made, and thereupon the Committee gives notice prior to the 7th December, 1929, by public advertisement of the levy, and upon such publication the levy shall be deemed to have been duly made.

The growers liable to pay the levy shall pay the same to the Commissioner for Railways on behalf of the Committee of Direction at the time they are consigning their fruit or vegetables. The levy will be expended in the payment of any expenses attaching to the collection of the levy, and the balance shall form part of the general funds for administrative purposes, and shall be utilised by the Deciduous Sectional Group Committee. The levy will operate for twelve months as from the 7th December, 1929.

The levy for the coming year will be 10d. per ton as against 5d. per ton last year.

Are there Too Many Shopkeepers?

"More than a century has elapsed since Napoleon stigmatised Britain as a nation of shopkeepers, but even to-day the taunt contains a certain element of truth. A visitor to the ordinary small country town will find that, apart from a few local industries, the main business of the town consists of shopkeeping, so much so, that he may well be pardoned for wondering whether all the shopkeepers in the town are trying to make a living by selling their wares to each other. This question as to whether the number and variety of retail shops in this country is redundant to its needs is one of considerable economic importance. Too many shops with too much competition can be as great an evil as too few. An excessive number of shops means that each one has too small a turnover out of which to earn its fixed charges, and so means that retail prices rule higher than they would under an ideal number. If four competing tradesmen are making each morning the round of a street which one man could easily cover, that is a clear example of wasteful effort for which the consumer in the long run has to pay."—"The Economist."

Practical Education.

"There is a widely prevalent notion that university extension is a kind of watered-down version of the education that is given in the university itself," said Principal L. P. Jacks in a recent speech, "and I am afraid it is true that a good deal of it has hitherto been precisely that. But of late years our eyes have been gradually opened to the fact that a course of university and water appeals only to a very limited section of the adult population. There are other ways of educating adults which do appeal to men and which yield far better results. It has been found both here and in America that multitudes of adults to whom the offer of book learning through classes and lectures makes no appeal are quickly attracted by the offer of any kind of practical skill, and that those who begin in this way by learning to do something significant for themselves are easily led on to an interest in the literature which tells of the great doings of others and to an interest in the things of the spirit in general."

A Doubtful Ideal.

"We are hearing a great deal at present of the desirability of brightening 'rural areas' (by which phrase newspapers now refer to the country), the brightening up to be done, of course, by townsmen by means of wireless sets, libraries, picture-houses, and all the things from which the townsman wishes to escape when he goes to the country. If there is one thing which the country has and which the town has not it is peace, even if only in the form of silence, and if there is one thing which the town has which the country has not it is commotion, even if only in the form of noise. No doubt the countryman sometimes wishes that the peace of the countryside was not so peaceful, and the townsman on occasions thinks that he would find life more agreeable if there was not such a ceaseless coming and going in the streets; but when the countryman feels that he really must have a little more excitement he can go to the town, and when the townsman begins to desire above everything surcease from strife he can pay a visit to the country. But to introduce an artificial commotion into the country and an artificial calm into the town would make it impossible for the countryman to escape from the country and for the townsman to get away for awhile from the town."—Mr. Hubert O'Toole, in the "Cornhill Magazine."

Spare that Tree!

This might well be applied to Queensland:—

"It's a fine day; let's go out and cut down something," might be put forward as a New Zealand version of an old gibe against the Englishman's liking for destruction. Certainly the history of New Zealand is tragically rich in contrast between the glorious natural endowment of forest and the indifference so many New Zealanders show towards the fate of trees. Public conscience is being strengthened in this direction, but there is still so much to do that one welcomes every victory over the forces of destruction. Traffic is not everything, otherwise the praise of the American motorist for a certain prairie State would be wisdom. This man was ecstatic about roads that ran without a bend for many miles, on which a motorist could 'do fifty' and go to sleep at the wheel. Among the tree-lovers of Palmerston North were a number of women who had sufficient enterprise to hold a meeting, with the result that the cutting of trees in the street has been suspended, and probably they will be saved. This is an interesting blow struck for beauty as opposed to utility, and should encourage others to be active in the same good cause.—Auckland "Star."

Soil Research.

"Soil research, not from the point of view of agriculture only, but of the world's population, which depends on the products of the soil for its existence, is a cardinal factor in the advancement of civilisation. The time, although still far distant, can yet be envisaged when mankind will be so numerous that the earth will have difficulty in finding sustenance for the teeming multitudes," says the "Aberdeen Free Press" referring to the Institute of Soil Research, so recently generously endowed by Mr. T. B. Macaulay, president of the Sun Life Assurance Company, of Canada. "That nation is to be envied the productivity of whose soil is sufficient to meet its own needs in food. The agriculturally self-supporting State is, from the point of view of economics and of certain factors in man-power, the ideal country. We in Britain are so reduced in agricultural resources that five-sixths of our food has to be imported, entailing a tremendous drain upon our communal wealth. Our soil is old and weary after countless generations of cultivation."

A World's Champion—Three Lactation Periods.

Queen Bessie Pietertje Ormsby, a pedigree Friesian cow belonging to Elwood Farms, Deerfield, Illinois, recently completed an official production record of 28,122.7 lb. milk and 1,128.4 lb. fat, with an average test of 4.01 per cent. She now holds the world's record for production for any three lactation periods. Her records now are:—Two years, 985.06 lb. fat; four years, 1,095.26 lb. fat; five years, 1,172.75 lb. fat; seven years, 1,128.40 lb. fat. This makes an average for the three last periods of 1,073 lb. fat.

The only cow to beat her for four lactation periods is Springbank Snow Countess, a Canadian Friesian cow, with records as follows:—Two years, 749 lb. fat; three years, 979 lb. fat; mature, 1,125 lb. fat; mature, 1,122 lb. fat; mature, 1,113 lb. fat.

The paternal grandsire of this cow is Sir Pietertje Ormsby Mercedes, who is the paternal great grandsire of Pioneer Snow Ormsby, the imported bull belonging to the Oakview Stud Farms, Auckland.

Fertilisers—Prices Reduced.

Mr. E. H. Lindsey, secretary, Board of Trade (Price Fixing), announces that reductions have been made in the unit values of nitrogen as ammonium sulphate, of water soluble phosphoric acid in super.; also a slight reduction in the unit values of potash in both sulphate and chloride (muriate).

In the case of ammonium sulphate with a nitrogen content of 20.5 per cent., present maximum price for this percentage will now be £17 18s. 9d. per ton, as against the previous price of £20 10s.

In the case of super. with a water soluble phosphoric acid content of 20.5 per cent., present maximum price £7 8s. 7d., against £8 4s. previously.

Potash in the form of sulphate will now be £16 4s. per ton, as against £16 16s.

Muriate of potash (chloride) with a potash content of 50 per cent.—the maximum price will now be £14 7s. 6d. per ton, previous price £15.

In the case of phosphoric acid derived from bone, the unit value has been increased by 6d.

Church on Wheels—New Uses for Motor Car.

Two uncommon motor vehicles have just been completed to special order by British manufacturers. They are a travelling bathroom, ordered by an Indian Prince, and a motor church, built to the specification of a Christian missionary society.

The mobile bathroom is built on a 30 cwt. chassis, and the interior includes a porcelain-lined bath, wash-hand basin, divan, and dressing table, all of which are cleverly designed to fit into the relatively small space available.

An ingenious apparatus, controlled by a thermostat, transfers the waste heat from the engine to the bath-water system, ensuring a constant supply of hot water. Special springs and Dunlop pneumatic tyres are fitted to the vehicle to ensure smooth running over rough jungle tracks. The car is to be used in the prince's hunting expeditions, and is fitted with a special glass which permits a clear view from the interior without the occupant being visible from the outside.

The motor "church" is mounted upon a lorry chassis fitted with Dunlop tyres, and it is equipped with an altar and reredos. The body is built so that it can be used as a pulpit, and the vehicle was consecrated before it was put into service.

The Richest Things in Life.

The whole edifice of modern civilisation would fall to the ground without a foundation of sound moral principle. The character of a people is the only security that can be relied upon for their making a proper use of the material advantages around them; all scientific inventions may come to nought, or even bring about evil, without moral guidance and inspiration (writes Mr. Charles Wicksteed in "Bygone Days and Now, a plea for Co-operation between Labour, Brains, and Capital"). The richest things in life are those that no wealth can give, and no poverty, short of destitution, can take away. An agricultural labourer who, with the aid of a thrifty wife, has a sufficiency, returning home after a hard day's work to the enjoyment of his frugal supper, with love in his heart for his wife and children, has the greatest joy that a man can have, and one which no millionaire can take away. A man may be rich, but no money will give him the joy he loses if he has no heart.

The First Veterinary Writers.

The veterinary art dates from that far-away time when man first bent the horse to his will. The earliest extant works on the diseases and injuries of horses belong to the fourth century of our era, and were written by army veterinarians of the Byzantine or Eastern Roman Empire, the chief of whom was one Apsyrtus, veterinarian in the army of Constantine the Great. The fourth century was not, however, the real starting-point of veterinary knowledge; there is ample evidence to show that there were skilled men in the times of ancient Greece. Xenophon wrote on the care and management of cavalry horses 800 years earlier than the time of Apsyrtus, and we know that his views are as true to-day as when written 2,400 years ago.

Aristotle, who lived 150 years later than Xenophon, devoted the eighth book of his history of animals to a consideration of veterinary medicine; he wrote, of course, as a layman. The Romans, on the other hand, were not skilled in medicine or surgery; in fact, for five centuries the medical art was unknown in Rome. Later they borrowed from Greece. If this was the condition of human practice it is easy to understand the position of veterinary medicine. Varro, a soldier who flourished in 36 B.C., and appears to have explored every branch of human activity, refers to the ancient Greek veterinarians as "Hippiatroi." He was evidently familiar with their work, of which, unfortunately, nothing remains. He himself wrote on the diseases of animals, and it is doubtless to such men that the Roman Army, even as early as the second century of our era, possessed an infirmary for sick animals, known as a "veterinarium." But Columella spoke of the "veterinarius," or animal physician, in 42 B.C. The irritating word "veterinary" is therefore extremely old; it disappeared with the final collapse of the Western Roman Empire, and was not met with again until the year 1528, though it did not appear in England until the closing days of the eighteenth century.

Vegetius' "Veterinary Art."—Among the contemporaries of Apsyrtus was one Chiron, a man whose work on veterinary medicine has only come to light in recent years. Shortly after Apsyrtus there lived a lawyer and gifted veterinarian, by name Hierocles, fragments of whose letters survive. It was from inspirations obtained from those gifted men that Vegetius, the Western Roman general, who flourished about the middle of the fifth century, wrote his remarkable treatise on "The Veterinary Art." He was not only a soldier, but a man of letters. Vegetius stands out in hold relief in the Western Roman Empire; he deplored the low state of the veterinary art in Italy, and tells us that the study of animal diseases is regarded as a mean and contemptible occupation. Though 1,500 years have passed since that was written, public opinion on this question has undergone very little change. The work of Vegetius may be read with interest to-day; he is very modern in some of his views, such, for instance, as the absurdity of regarding outbreaks of disease as being evidence of Divine wrath; he urges the public in these cases to place their faith in medical aid rather than in incantations and charms.

It is fortunate amid the disruptive influence of 1,000 years that the work of Vegetius has been spared and was amongst the earliest books printed in Europe, being published in 1528. Two years later what was left of the manuscripts of the Byzantine veterinary writers—i.e., Apsyrtus, Hierocles, and their many correspondents—was published in Paris under the orders of Francis I., the title then given to the collection being "The Hippiatrica." How these manuscripts got to Paris is unknown; probably, with many others, they were brought back from Constantinople by the Crusaders. It is interesting to note that a copy of the fragmentary manuscripts of these early Byzantine veterinary authorities is regarded as one of the literary treasures of the world.—"Live Stock Journal" (Eng.).

School Training.

It is quite true, as many persons might hasten to tell us, that great men have been developed without the benefits of University training; it is quite true that unusual genius will bring the man of special gifts to the front. But neither school nor University devotes itself to the development of the superman; the principal attention is devoted to that great mass of boys and girls who must have adequate opportunities, who must be strengthened and guided and taught. At no time in our history were we confronted with greater problems than those of to-day; never was there greater demand for the administrative and the operative ability of our citizens. Brains and character will be the first line of our national defence in the future. Can we afford to deny all reasonable facilities? That is for the people themselves to answer, because upon their answer depends the interest of Governments. —The "Brisbane Courier."

A Whitewash Formula.

Obtain, if possible, large pieces of fresh lump lime, place them in a very large bucket or other suitable container, and into this pour hot water. Cold water will do, but hot water is better as it hastens the slaking. The lime will start to boil and break up. Keep it covered all the time with about half an inch of water. This is important, for if whilst the lime is slaking it is allowed to rise up above the water in a dry powder it will "curdle," a condition tolerated only by inexperienced and indifferent workmen. Before the lime commences to boil fiercely, add tallow or common fat in the proportion of about 1 or 2 lb. to 7 lb. of lump lime. This makes a good binder which will prevent the wash from rubbing off.

If desired, a little yellow ochre may also be added, which will give a cream or buff tint according to the quantity used. When the lime is thoroughly slaked it should be stirred and sufficient water added to make it a little heavier than, say, milk, after which it should be strained, and, if desired, may be applied whilst hot.

Girdling the Earth.

"I'll put a girdle round about the earth in forty minutes," said Shakespeare through the mouth of Puck some 340 years ago. That was fantasy, for Magellan, who was the first to circumnavigate the earth, took three years only three-quarters of a century earlier. But who is to say that Puck's boast will not yet cease to be a boast? In the 16th century modern speeds were not dreamt of. During the last fifth-three years the time it has taken to "put a girdle round the earth" has been reduced from 117 days to twenty-one days. In 1876 Captain W. D. Seymour took 117 days in 1889, Miss Nellie Bly encircled the globe in 72 days 6 hours 11 minutes 14 seconds; since when the following times have been recorded:—Geo. Francis Train (1889), 67, 12, 3; Captain Fitzmorris (1901), 60, 13, 29 $42\frac{3}{5}$; Henry Frederick (1903), 54, 7, 20; Colonel Burnley Campbell (1907), 40, 19, 30; A. Jaegar-Schmidt (1911), 39, 19, 42, $37\frac{4}{5}$; J. H. Mears (1913), who used a hydro-aeroplane to cross Paget Sound, 35, 21, 35, $0\frac{4}{5}$; E. C. Evans and L. O. Wells (1926), 28, 14, 36, 51; J. H. Mears and Captain Chas. Collyer (1928), who took their own aeroplane and used it for eight flying days, 23, 15, 8; the Graf Zeppelin (1929), 21, 7, 32. All these people, except the travellers in the Graf Zeppelin, spent practically the whole of the time in actually travelling, whereas the Zeppelin was in flight only 11 days 23 hours 33 minutes.—"Brisbane Courier."

The Future of Cotton.

Discussing the outlook of the cotton industry in Lancashire, a writer in the "Fortnightly Review" suggests that probably too much attention is being devoted to the discovery of means for reviving the trade in coarse grey cloths, which other countries are able to produce themselves, and will continue to do so, even if they have to raise high tariffs against Lancashire. "Even if we do not recover any of that which has been lost, our cotton trade remains a very large one," he continues. "To say that the whole trade is doomed is ridiculous. To talk in generalities at all about the cotton trade is ridiculous. It is far too varied. There are plenty of units who have succeeded in doing well all through the bad years. We are still the largest exporting country of cotton textiles, and the home trade alone is not inconsiderable. All this will be stimulated by a cheapening of the cost of production. The same applies to the trade in new styles which we hope to see developed by ingenuity and craftsmanship. Ingenuity has not been lacking in the past, and one feels that it must still be present in plenty, unless it is being concentrated upon the newer industries of Great Britain. It has, however, been a peculiar feature of British mentality

that a stimulus of impending disaster is required before really the latent ingenuity of the people can reveal itself. Witness the many rapid improvisations brought out by the war. Possibly the cotton trade is not yet sufficiently near to the abyss to awaken such inventive powers. Howbeit, upon ingenuity the future must largely rest, and upon the elimination of the inefficient producers.''

Rubber Tyre Wear and its Cause.

Interesting data about tyre wear and its causes is supplied by Mr. L. J. Lambourn, M.Sc., A. Inst. P., A.I.R.I. (Sc.), of the Fort Dunlop Research Laboratory, from which it is learnt that there is considerable difficulty in obtaining definite data about tyre wear if the research is confined to tyre service on the road. In comparing one tyre with another, speed, the type of driving, the type of car, the kind of road surface, the weather, the air temperature, all vary so much that it is not easy to get accurate results. In order to wipe out all these variables, a special machine has been developed and patented in which conditions representative of rough roads, wet roads, roads covered with dust, quick acceleration, wheel spin, high temperature, can all be reproduced and controlled. The relation between abrasion, or wear of tyres, and slip, which, of course, is always taking place when tyres are running, can be quite accurately determined. Approximately, the rate of wear increases not in direct ratio to the slip, but rather as the square of it up to values of about 25 per cent. Above that value, the relation is approximately linear. As showing the accuracy with which the machine and road results can be compared, samples of the actual treads of the machine and road results can be compared, samples of the actual treads of tyres were made into test wheels while the real tyres were run under average conditions, and the rate of wear of the tyre on the road and on the machine was compared. The value of a hundred being taken to represent the standard tread compound, the following results were obtained:—

RELATIVE WEAR.

On the Road.	On Machine.
100	100
130	139
142	150
225	200
93	95
117	117
92	92

Other tests, on the road, showed that one tyre on a car ran 8,400 miles during December to March while another, used during April, May, and June, ran only 6,000 miles. Another test, in which two exactly similar tyres were run at the same period on the rear wheels of two cars of the same type, showed that the rate of wear on the one run on rough roads was twice that of the other, run on tarmac. Two tyres were again run on the rear wheels of a touring car and a sports car respectively. The tyre on the touring car ran for 5,000 miles under average conditions, but the other tyre was worn to this same extent after running only 335 miles at an average of 90 miles per hour on a racing track. Considering fast touring speeds, the rate of tread wear on tyres which average 50 miles per hour was found to be about 0.17 m.m. per 1,000 miles and this is about twice the rate of wear of tyres run at an average speed of 30 miles per hour. Above 65 miles per hour the increase in wear is very rapid. Excessive toe-in has a very bad effect and it has been found that a toe-in of an ⅛ of an inch should not be exceeded, otherwise the tyre will not last its full life. A tyre run with a toe-in of ½ inch was nearly worn out after 3,700 miles. Another with a toe-in of 1/16 inch has run 9,000 miles and is not yet nearly worn out.

Tests made for wheel slip with a motor cycle combination showed that on a cross country run at normal speeds there was a total slip of only 1½ per cent., but on a rough road a short run at 62 miles per hour gave a slip of 4½ per cent. By fiercely engaging the clutch for rapid acceleration a slip of 16 per cent. was obtained. In a similar ''getaway,'' measuring the slip on the first 33 yards only, it amounted to the very high figure of 48 per cent. If the slip be doubled, four times the amount of tread rubber will be worn away.

It is of interest to note how the wear of tyres varies according to the season of the year, partly due to the temperature and partly due to the wetness or dryness. For instance, the rate of wear of a large quantity of tyres in July of three successive years was 9/10 m.m. per thousand miles, while in January of the corresponding years, it was only 6/10 m.m. per thousand miles.

The Home and the Garden.

OUR BABIES.

Under this heading a series of short articles by the Medical and Nursing Staff of the Queensland Baby Clinics, dealing with the welfare and care of babies, has been planned in the hope of maintaining their health, increasing their happiness, and decreasing the number of avoidable cases of infant mortality.

THE HOT WEATHER BOGEY.

Baby enjoys the hot weather. There is nothing that pleases him better than to exercise his limbs freely in the most scanty attire, or in nothing at all, unless it is to splash about in a tub of tepid water. He is released from the burden of clothing, which oppressed him in the cold season, and cramped his movements.

Hot weather is healthy. The three coolest States of Australia have the highest infantile mortality. Last year Queensland had the lowest. That hot weather is dangerous to infant life is just a silly bogey.

Of course, special care is needed during the hot season in some respects. If you overclothe baby he will suffer from prickly heat. This is caused by excessive sweating when the sweat is not allowed to evaporate freely. Dress him in cool singlets—not in heavy woollens. Outside the singlet he should wear only the coolest of airy garments, and these should be taken off when he is indoors. Do not torment him with flannel binders. Prickly heat is worst on his back, because he lies on that, and the perspiration cannot dry off quickly. Let him lie on cool sheets, or better still, on cool vegetable mats. Turn him over sometimes, when he is asleep, and train him to lie on his side.

He does not now need so much heat-forming food. Give him rather less solid food, rather less sugar and fat (clinic emulsion for instance). But he needs more fluid, so let him drink as much boiled water as he likes between his meals. Do not forget that this is necessary for babies who are on the breast.

Boil Baby's Milk.

During warm weather all kinds of bacteria grow very rapidly, and so food does not keep, but undergoes changes, which make it unwholesome, and sometimes even dangerous. Especially is this true of milk. You know how quickly it goes sour. Unfortunately, it changes in other ways, which are more harmful than sourness. Therefore, be careful to boil your milk as soon as you get it; then keep it in a cool place carefully protected from flies. Pasteurised milk delivered in bottles does not need to be boiled. It will keep good for twenty-four hours on ice; but otherwise, if you have only one delivery, you will need to boil it within twelve hours if it is to be kept till next morning. Should your milk be stale or dirty before it is boiled, it will cause loose motions. When good, fresh milk cannot be had, you may use dried milk (Glaxo or Lactogen).

Diarrhoea.

Loose motions or diarrhœa is common in warm weather, and needs careful watchfulness. Should your baby suffer from this, you must at once stop giving him milk or any kind of food except very thin barley-water slightly sweetened. Let him drink as much as he wants; he will be thirsty, but not hungry. It may be even necessary to take him off the breast for one or two days. You may also give him one teaspoonful of castor oil to clear out any undigested food. Within twenty-four or forty-eight hours he should be much better, and probably a little hungry. A little breast milk may then be given, or you may then give him whey made with junket tablets, but the whey must first be brought to the boil. If he is over nine months, you may also give him some arrowroot, cornflour, or sago boiled with water without milk, or a finger of bread baked hard and crisp. Do not give him milk foods until his motions become natural, and give the milk at first in very small quantity, increasing it gradually.

By this treatment attacks of simple diarrhœa are usually easily cured. But it is very different with diarrhœa caused by infectious bacteria. Of these the most dangerous is dysentery. We told you last month how to guard against this epidemic, which attacks us every year in the early summer during the fly season—not, be it observed in the hottest time of the year, when the epidemic usually subsides.

Babies Killed by Ignorance.

We hope that our advice will be carefully observed, and that it will save many lives. The cause of the increased sickness and more frequent deaths among our infants during the summer is not the hot weather; it is the prevalence of dysentery and other bowel infections during this season. This infection occurs so frequently because mothers do not know how the dysentery bacilli get into their babies. Babies have died from want of knowledge.

THE PREMATURE BABY.

Most people know that when a baby is premature—that is, born before its time—it needs special care and treatment, but many have little knowledge of the special points which require immediate attention, if the child is to have a reasonable chance of survival.

If even half of the premature babies who are born each year in Queensland could live, there would be a marked lowering of the infantile death rate. Of all the deaths that take place in children under one year, about half occur during the first month of life. A large number of these children are either premature, or feeble, weakly infants, who should receive the same care as those who are premature. Such cases should always be under the care of a doctor.

If a baby is under 5 lb. when born, it is better to treat it as premature, to get satisfactory results. Those under 2½ or 3 lb. in weight rarely survive, though cases are on record where infants of less than 2 lb. have lived and developed into healthy children.

In appearance, the premature baby differs from the normal baby in more than size. The little body is very soft and limp; the skin wrinkled and downy, and because it is thinner than usual, it looks redder. All the muscles are weak, and the infant is often too feeble to suck. The cry is feeble and suggestive of the mewing of a young kitten. Often the baby cannot cry at all. Such cases need special care from the moment of birth.

FOUR IMPORTANT POINTS.

There are four points which should receive attention. They are prevention of chilling of the baby (that is most important and must come first): careful feeding, on mothers milk; careful avoidance of risk of infection; and avoidance of all unnecessary handling.

Prevention of Chilling.

Because the baby has come too soon into the world, the power of the body to manufacture and regulate its heat is not yet properly developed, and the temperature can quickly fall to a dangerously low level. A premature baby who is allowed to become thoroughly chilled soon after birth rarely lives. When we know that an infant is to be born prematurely, special preparation should always be made to prevent this chilling. A cot should be prepared and thoroughly warmed for its reception. Baby must not be bathed, nor yet even oiled, but as soon as it is born, wrapped in warmed cotton wool or soft flannel, and placed in the cot. At the end of six or eight hours it can be oiled over with warm olive oil and cotton-wool swabs, taking care to do it as quickly as possible and with as little handling of the child as possible. Very frail babies should be oiled without being removed from their cots, and the cot should be placed in a warm, sheltered place, and protected from all draughts by screens while this is being done. In hospitals, special cots are kept for premature babies. These are not always available in private homes, but a very useful and comfortable cot can be quickly improvised. A dress basket does admirably; failing this, the family clothes basket can be used, or a drawer out of a chest of drawers can be made to serve, though this last is not deep enough to be as suitable as the two previously mentioned. To prepare the improvised cot: if the weather is cold, first line it with paper—newspaper does quite well—then throw a blanket over it, covering it completely. Next, in the bottom of the basket and over the blanket, place a pillow to serve as a mattress. A pillow-slip or flannelette napkin serves as a sheet, and a small, folded, soft napkin as a pillow. On this the baby,

wrapped in cotton wool and its soft woollen shawl, is placed with a baby blanket over it. The enveloping blanket is now drawn from each side across the cot, but this is not enough warmth for the premature baby. Hot water bags or bottles will be required. Rubber bags are best, but any bottles can be made to serve. In cold weather three are required, in warm weather two will probably be enough. One bag is placed under the mattress at the foot of the bed, and the others at the sides, not close to baby's body but lying on edge, tucked down between the enveloping blanket and the mattress. For the bottle at the foot of the bed use two-thirds boiling water and one-third cold water; for the side bottles use equal parts cold and boiling water. The bags must be refilled in rotation, one every hour in cold weather, less often in summer. Give baby plenty of fresh air—keep him in a well-ventilated room. In our Queensland climate, the air even in winter is not cold enough to hurt the premature baby, provided his bed is kept properly warm. Guard against over-heating. It is wise to have a dairy thermometer in the bed, and this should register between 85 and 95 deg. Fahr.; never more, or it will do baby harm. Gradually decrease the artificial heat as baby's condition improves. Oil baby every second day, taking the same precautions as for the first oiling. Do not put him in the bath until he weighs 5 lb.. As he improves, commence with sponging, at first only hands and face, and gradually increase until he is being fully sponged, and later, bathed.

Careful Feeding.

For our premature baby, mother's milk is practically essential. Few survive without it. If circumstances make it impossible for the mother to feed her own baby, endeavour to get milk from another healthy mother. A relative can sometimes be found who has a baby of her own, and so is able to supply some breast milk. It does not matter at all if the foster-mother's milk baby is six or even more months old. It will not hurt the premature baby, but it may sometimes be necessary at first to dilute the milk with equal parts of water. If the foster-mother is a stranger, or there is any doubt about her health, boil the milk before giving it to baby. Nothing but plain, boiled water should be given to the premature baby for the first twenty-four or thirty-six hours. After that it must have food. It is impossible to say exactly how much the child should have or how frequently it should be fed. Some strong premature babies can suck the breast and get all they need. Others are quite unable to suck, and at first almost unable to swallow. Such cases must be fed with a pipette or eye dropper, and the milk must be expressed from the mother's breasts and fed to the child. If baby can take very little, say only one or two teaspoonsful at a time, he must be fed every two hours, with one night interval of three hours. With a feeble baby, it may take twenty minutes or even more to take even this small quantity. Increase the interval between feeds by a quarter of an hour at a time, to three hours, with one longer night interval, as soon as baby can take a larger quantity at a feed. Also substitute a small feeding-bottle for the eye dropper as soon as the child shows signs of sucking.

If mother's milk is unprocurable, whey may be tried, at first diluted to half strength, until advice can be obtained from a doctor or welfare nurse. A rough estimate of the amount of food that a premature baby should take, is 3 oz. for each pound of body weight. So if baby weighs 3 lb., try to give him 9 oz. of fluid daily. He may take much less at first.

Prevention of Infection.

As a result of being undeveloped and weak, baby is very susceptible to infection. Because he is so tiny, he is generally an object of interest and curiosity to neighbours and friends who come to visit him. In his interest this should not be allowed. Even a common cold in an attendant or visitor can easily lead to a fatal pneumonia in a premature baby. For this reason isolate him as far as possible. Have no unnecessary visitors and as few attendants as can be. If mother or nurse develops a cold, she should tie a piece of gauze over her nose and mouth while attending to the child.

Avoidance of Handling.

Handling is very harmful to the feeble premature baby. Until he shows signs of increasing strength, do not remove him from his cot while feeding or oiling him. Handle as little and as gently as possible while changing him; but change of position is necessary; turn him from one side to the other every four hours. The care of a frail, premature baby entails not only much care and trouble, but a high degree of skill. The successful rearing of such an infant is justly a source of pride to mother or nurse.

FOR THE COUNTRY GIRL—SOME OPPORTUNITIES.

"What superior opportunities girls in the cities have!" sighs the country girl. "In what line?" you ask. "Opportunities for education, money-making, fun." It is true that salaried positions are more numerous in the city than in the country, but the country girl has many more ways of earning odd shillings. For, primarily, she has space—a necessity for growing anything, vegetable or animal, and the products of the farm are in never-ceasing demand. Butter, eggs, honey, preserves and jellies, chickens and vegetables are always marketable. Ingenuity will make the marketing exceedingly profitable.

Develop Originality.

Develop your originality. It is originality which makes one potent or impotent, and originality will grow if stimulated. Do not say: "But I am too far from a market to raise pigeons," or "there are no rare butterflies in our neighbourhood," but think out your own environment; study your own ability; imagine and create an opportunity for yourself.

Of course, in higher and specialised lines, the city girl may become educated more easily than her country cousin. But even when it is impossible for you to leave the farm, you can accomplish much in any desired line.

All Universities are giving more and more attention to extension work, and you can go far towards a degree without ever seeing the college buildings. And all their help you are entitled to. The State University is your University; your taxes support it.

Courses will be laid out for you, reading suggested, and books loaned.

Aid and inspiration may be had for the asking from the city and travelling libraries. Outline courses will be sent you which contain the ability of experts. And there are correspondence schools whose text-books are often by masters in their lines.

One girl I know has obtained very fine instruction in music by organising a class for a teacher from a nearby town. The teacher comes to her home one day in the week, and there gives lessons to all of the pupils. The girl who organised the class pays nothing for her own lessons, but gives the teacher the use of her home, and furnishes her luncheon.

Many teachers of drawing, music, and dancing take long annual vacations. Perhaps an advertisement in some city paper that board on the farm during the summer would be given in exchange for one lesson a day, would get a response. In such a case, you could probably "sub-sell" three of the lessons each week and take three yourself.

But you will say that you want sometimes to get away from the country; to be in the city; to see its plays and to be part of its merry gaiety.

Of course you do, just as your city friends long ardently for the country. So let us consider ways of earning money for trips to the city, and delightful tastes of its pulsing life.

As a modification of the summer boarder idea, a girl might make a fancy little sum by boarding and caring for the children of people who wish to travel in summer. Children are so enthusiastic over farm life that they practically entertain themselves. And, being clad with extreme simplicity, they are very little trouble.

If your home has an attractive site, especially if it offers boating or fishing, arrange and advertise a camping ground. You may either charge a small fee for tenting privileges, or omit the fee to secure an easy and profitable market for milk, butter, eggs, vegetables, preserves, home-made bread, and pies.

Home Industry.

Pickles, jellies, and candied fruits, when of superior quality, command high prices and show a large percentage of profit when the fruit is home grown. To save a great proportion of the work during the summer months, defer the jelly and jam making until the autumn. That is, cook the berries and other fruit sufficiently, and can them without sugar. Later make them into jellies, jams, and so on as indicated by the demand. The freshly made jams and jellies have a certain charm of flavour that is lacking in those that have stood very long. The deferring of part of the labour is a great help to the farm girl, for summer is a busy season on the land, and, at that time, outside help seems to be non-existent.

I have an idea, however, that an advertisement in a city paper would bring answers from girls who are not otherwise domestic helps, who would be willing to work several hours each day in exchange for board. Two such girls would be a decided help, and might be pleasurable friends as well.

Roadside Tea-houses.

Many a profitable tea and luncheon place has been developed from very small beginnings by country lasses. In these days of the far-going auto, there is increasing demand for such places. Here, naturally, environment should determine the choice of food offered, but in no case should an effort be made to compete with the city. Simplicity should dominate. Near the beach fish and oysters may be profitably served, and many little oddities of weed and shell life sold. On the inland farm the dairy products and vegetable salads are suitable, and a good trade may often be built up in hampers of fresh vegetables, thus eliminating the middleman bugaboo . . .

The gathering of medicinal herbs, the raising of cats and dogs, of rabbits, of mushrooms, pigeons, of poultry, and of bees, all offer suitable pursuits for the country girls and her small brothers. And, should she make a great success in any line of endeavour, she can add a little to her store of pin-money by detailing that success in simple and effective language for the farm papers, which are always in the market for accounts of actual and practical money-making experiences.

All these merely by way of suggestion. If none of them fits your case or abilities exactly, vary them, make them fit, or invent other opportunities—find them rather, for opportunities in one shape or another generally abound, if one has the eyes to see. It is largely a matter of gumption, and the girl who lacks that, could not succeed at anything, even though the whole plan were "cut and dried for her." "God helps those who help themselves."—Elizabeth Whitford in the "California Cultivator" (adapted).

Farm Notes for February.

Reference was made in last month's Notes to the necessity for early preparation of the soil for winter cereals, and to the adoption of a system of thorough cultivation in order to retain moisture in the subsoil for the use of crops intended to be raised during the season. The importance of the subject, and its bearing in relation to prospective crop yields, is made the excuse for this reiteration.

Special attention should be given to increasing the area under lucerne (broadleaf Hunter River), wherever this valuable crop will grow. Its permanent nature warrants the preparation of a thorough tilth and seed bed, and the cleansing of the land, prior to sowing the seed, of all foreign growths likely to interfere with the establishment and progress of the crop. Late in March or early in April is a seasonable period to make the first sowing providing all things are favourable to a good germination of seed.

Dairymen would be well advised to practise the raising of a continuity of fodder crops to meet the natural periods of grass shortage, and to keep up supplies of succulent fodder to maintain their milch cows in a state of production.

Many summer and autumn growing crops can still be planted for fodder and ensilage purposes. February also marks an important period as far as winter fodder crops are concerned, as the first sowings of both skinless and cape barley may be made at the latter end of the month in cool districts. Quick-growing crops of the former description, suitable for coastal districts and localities where early frosts are not expected, are Soudan grass, Japanese and French millet, white panicum, liberty millet, and similar kinds belonging to the Setaria family. Catch crops of Japanese and liberty millet may also be sown early in the month in cooler parts of the State, but the risk of early frosts has to be taken.

Maize and sorghums can still be planted as fodder and ensilage crops in coastal districts. In both coastal and inland areas, where dependence is placed largely on a bulky crop for cutting and feeding to milch cows in May and June, attention should be given to Planters' Friend (so-called Imphee) and to Orange cane. These crops require well-worked and manured land; the practice of broadcasting seed for sowing at this particular season encourages not only a fine stalk but a density of growth, which in itself is sufficient to counteract to some extent the effect of frost.

In most agricultural districts where two distinct planting seasons prevail, the present month is an excellent time for putting in potatoes. This crop responds to

good treatment, and best results are obtainable on soils which have been previously well prepared. The selection of good ''seed'' and its treatment against the possible presence of spores of fungoid diseases is imperative. For this purpose a solution of 1 pint of formalin (40 per cent. strength) to 24 gallons of water should be made up, and the potatoes immersed for one hour immediately prior to planting the tubers. Bags and containers of all kinds should also be treated, as an additional precaution. ''Irish Blight'' has wrought havoc at times in some districts, and can only be checked by adopting preventive measures and spraying the crops soon after the plants appear above the ground. Full particulars on the preparation of suitable mixtures for this purpose are obtainable on application to the Department of Agriculture, Brisbane.

Weeds of all kinds, which started into life under the recent favourable growing conditions, should be kept in check amongst growing crops; otherwise yields are likely to be seriously discounted. The younger the weeds the easier they are to destroy. Maize and other ''hoed'' crops will benefit by systematic cultivation. Where they are advanced, and the root system well developed, the cultivation should be as shallow as possible consistent with the work of weed destruction.

First sowings may now be made of swede and other field turnips. Drilling is preferable to broadcasting, so as to admit of horse-hoe cultivation between the drills, and the thinning out of the plants to suitable distances to allow for unrestricted development. Turnips respond to the application of superphosphate; 2 cwt. per acre is a fair average quantity to use when applied direct to the drills.

Where pig raising is practised, land should be well manured and put into good tilth in anticipation of sowing rape, swedes, mangels, field cabbage, and field peas during March, April, and May.

Orchard Notes for February.

THE COASTAL DISTRICTS.

February in coastal Queensland is frequently a wet month, and, as the air is often heavy with moisture and very oppressive, plant growth of all kinds is rampant, and orchards and plantations are apt to get somewhat out of hand, as it is not always possible to keep weed growth in check by means of cultivation. At the same time, the excessive growth provides a large quantity of organic matter which, when it rots, tends to keep up the supply of humus in the soil, so that, although the property looks unkempt, the fruit-producing trees and plants are not suffering, and the land is eventually benefited. When the weed growth is excessive and there is a danger of the weeds seeding, it is a good plan to cut down the growth with a fern hook or brush scythe and allow it to remain on the ground and rot as it will thereby prevent the soil from washing, and when the land is worked by horse power or chipped by hand it will be turned into the soil. This is about the most satisfactory way of dealing with excessive weed growth, especially in banana plantations, many of which are worked entirely by hand.

The main crop of smooth leaf pineapples will be ready for canning, and great care must be taken to see that the fruit is sent from the plantation to the cannery with the least possible delay and in the best possible condition. The only way in which the canners can build up a reputation for Queensland canned pineapples is for them to turn out nothing but a high-class article. To do this they must have good fruit, fresh, and in the best of condition.

The fruit should be about half-coloured, the flesh yellowish, not white, of good flavour, and the juice high in sugar content. Over-ripe fruit and under-ripe fruit are unfit for canning, as the former has lost its flavour and has become ''winey,'' while the latter is deficient in colour, flavour, and sugar content.

For the 30 or 32 oz. can, fruit of not less than 5 in. in diameter is required, in order that the slices will fit the can; but smaller fruit, that must not be less than 4 in. or, better still, 4½ in. in diameter, and cylindrical, not tapering, can be used for the 20-22 oz. can.

Bananas for shipment to the Southern States should on no account be allowed to become over-ripe before the bunches are cut; at the same time, the individual fruit should be well filled and not partly developed. If the fruit is over-ripe it will not carry well, and is apt to reach its destination in an unsaleable condition.

Citrus orchards require careful attention, as there is frequently a heavy growth of water shoots, especially in trees that have recently been thinned out, and these

must be removed. Where there are facilities for cyanidings, this is a good time to carry out the work, as fruit treated now will keep clean and free from scales till it is ready to market. Citrus trees can be planted now where the land has been properly prepared, and it is also a good time to plant most kinds of tropical fruit trees, as they transplant well at this period of the year.

A few late grapes and mangoes will ripen during the month, and, in respect to the latter, it is very important to see that no fly-infested fruit is allowed to lie on the ground but that it is gathered regularly and destroyed. Unless this is done, there is every probability of the early citrus fruits being attacked by flies bred out from the infested mangoes.

Strawberries may be planted towards the end of the month, and, if early ripening fruit is desired, care must be taken to select the first runners from the parent plants, as these will fruit quicker than those formed later. The land for strawberries should be brought into a state of thorough tilth by being well and deeply worked. If available, a good dressing of well-rotted farmyard manure should be given, as well as a complete commercial fertiliser, as strawberries require plenty of food and pay well for extra care and attention.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

The marketing of later varieties of peaches and plums, and of mid-season varieties of apples and pears, as well as of table grapes, will fully occupy the attention of fruitgrowers in the Granite Belt, and the advice given in these notes for the two previous months, with regard to handling, grading, packing, and marketing is again emphasised, as it is very bad policy to go to all the trouble of growing fruit and then, when it is ready to market, not to put it up in a way that will attract buyers.

Extra trouble taken with fruit pays every time. Good fruit, evenly graded and honestly packed, will sell when ungraded and badly packed fruit is a drug on the market. Expenses connected with the marketing of fruit are now so high, owing to the increased cost of cases, freight, and selling charges, that it is folly to attempt to market rubbish.

During the early part of the month it will be necessary to keep a careful watch on the crop of late apples in order to see that they are not attacked by codlin moths. If there is the slightest indication of danger, a further spraying with arsenate of lead will be necessary, as the fruit that has previously escaped injury is usually that which suffers the most.

Fruit fly must also be systematically fought wherever and whenever found, and no infested fruit must be allowed to lie about on the ground.

Grapes will be ready for market, and in the case of this fruit the greatest care in handling and packing is necessary. The fruit should never be packed wet, and, if possible, it is an excellent plan to let the stems wilt for a day at least before packing. This tends to tighten the hold of the individual berries on the stem and thus prevent their falling off.

In the western districts winemaking will be in progress. Here again care is necessary, as the better the condition in which the fruit can be brought to the press the better the prospect of producing a high-class wine.

Where necessary and possible citrus trees should be given a good irrigation, as this will carry on the fruit till maturity, provided it is followed up by systematic cultivation so as to retain a sufficient supply of moisture in the soil.

Readers are reminded that a cross in the prescribed square on the first page of this "Journal" is an indication that their Subscription —one shilling—for the current year is now due. The "Journal" is free to farmers and the shilling is merely to cover the cost of postage for twelve months. If your copy is marked with a cross please renew your registration now. Fill in the order form on another page of this issue and mail it immediately, with postage stamps or postal note for one shilling, to the Under Secretary, Department of Agriculture and Stock, Brisbane.

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY D. EGLINTON, F.R.A.S., AND A. C. EGLINTON.

TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

	December, 1929.		January, 1930.		MOONRISE Dec., 1929.	MOONRISE Jan., 1930.
Date.	Rises.	Sets.	Rises.	Sets.	Rises.	Rises.
					a.m.	a.m.
1	4.50	6 32	5.2	6.48	4.24	5 35
2	4.50	6 32	5 2	6.48	5.9	6.28
3	4.50	6.33	5 3	6.48	5.57	7.23
4	4.50	6 34	5 4	6.49	6.48	8 19
5	4.50	6 35	5 4	6.49	7.42	9.14
6	4.50	6 35	5.5	6 49	8.37	10.9
7	4.50	6.36	5 6	6.50	9.31	11 2
8	4 51	6 37	5.7	6.50	10.26	11.57
						p.m.
9	4 51	6.37	5.8	6.50	11.20	12 55
					p.m.	
10	4 52	6 38	5 9	6.50	12 16	1.56
11	4 52	6.38	5.10	6.50	1.11	3.2
12	4.53	6 39	5 11	6.50	2.9	4.11
13	4.53	6 39	5 12	6.50	3.10	5.19
14	4.54	6.40	5.13	6.50	4.17	6 27
15	4.54	6.40	5.14	6.50	5.27	7.29
16	4.55	6.41	5.15	6.49	6.36	8.22
17	4.55	6.41	5.15	6.49	7.46	9.5
18	4.55	6.42	5.16	6 49	8.50	9.41
19	4.56	6.43	5.17	6.48	9.47	10.14
20	4.56	6.44	5.18	6.48	10.30	10.46
21	4.56	6.44	5.19	6.48	11.9	11.18
22	4 57	6.45	5.20	6 47	11.43	11.50
23	4 57	6.45	5.21	6 47	...	...
					a m.	a.m.
24	4.58	6.46	5.21	6.47	12.16	12.26
25	4.58	6.46	5.22	6.46	12.46	1,5
26	4 59	6.46	5 23	6.46	1.18	1.50
27	4 59	6.47	5.24	6 46	1.51	2.39
28	5 0	6·47	5.24	6.46	2.27	3.31
29	5.0	6.47	5 25	6.45	3.6	4.24
30	5.1	6.48	5.25	6.45	3.52	5.19
31	5.2	6.48	5.26	6.45	4.43	6.14

Phases of the Moon, Occultations, &c.

8 Jan.	(	First Quarter	1 11 p.m.
15 ,,	O	Full Moon	8 21 a.m.
22 ,,	)	Last Quarter	2 7 a.m.
30 ,,	●	New Moon	5 7 a.m.

Apogee, 2nd January, at 1·48 a.m.
Perigee, 15th January, at 10·24 a.m.
Apogee, 29th January, at 2·12 a.m.

On the 3rd the earth will make her nearest approach to the Sun from which its distance will be 91,300,000 miles.

The planets Venus, Mars, and Saturn will be apparently close to one another on the morning of the 3rd; but as they will rise only about one half-hour before the Sun they will be lost in the coming daylight.

On the 6th Mercury will be at its greatest distance, 19 degrees on the east side of the Sun.

The occultation of Tota Geminorum by the Moon, on the 14th instant, which will take place about 11 p.m., will not be visible north of Mackay, where the star will appear very near the northern edge of the Moon. Through binoculars or telescope it will be interesting to watch the star apparently skirting the northern limb of the full Moon. In the southern half of Queensland the star will disappear behind the Moon sooner further south and its reappearance will be proportionately retarded.

On the evening of the 27th the Moon will be passing from the west to the east side of Saturn, but 5 degrees further south. Although this will occur near midday the Moon will be visible in the north-west and Saturn can be brought into view with binoculars.

The Moon will be in the constellation Capricornus from the 1st to the 4th; in Aquarius from the 4th to the 6th; in Pisces and Cetus from the 6th to the 9th; in Aries from the 9th to the 11th; in Taurus and Auriga from the 11th to the 14th; in Gemini from the 14th to the 15th; in Cancer from the 15th to the 17th; in Leo from the 17th to the 18th; in Virgo from the 18th to the 22nd; in Libra from the 22nd to the 24th; in Scorpio and Orphineus from 24th to the 26th; in Sagittarius from the 26th to the 27th—New Moon on the 30th.

As the Southern Cross will be at the lowest part of its daily circle, about 6 p.m. in the beginning of the month and will not reach its most eastern position (ix.) till midnight, it will barely be coming into view in the south-east at 9 p.m. with its head slanting downwards to the left. Reaching these positions 4 minutes earlier each evening 2 hours will be gained by the end of the month.

For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S., add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhat about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

A Cross in this space is a reminder that your Subscription to the Journal expires with this number.

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QUEENSLAND AGRICULTURAL JOURNAL

VOL. XXXIII. 1 FEBRUARY, 1930. PART 2.

Event and Comment.

Malting Barley.

WHEN on the Darling Downs on a tour of inspection through the wheat areas recently, Mr. J. D. Annand, M.L.A., interested the Minister of Agriculture and Stock, Mr. Harry F. Walker, in the practicability of extending the cultivation of malting barley. After due inquiry, Mr. Walker arranged a conference, at which growers, malsters, and brewers were represented, for the purpose of discussing the disposal of the present season's surplus and the possibility of arriving at a working arrangement in respect of future crops that would be satisfactory to all parties. As a result of this conference and subsequent negotiations, the Minister announced recently that he was in a position to state the nature of a possible arrangement which it was proposed to submit to the growers for their consideration.

The production of malting barley in Queensland over a period of five years averages 69,000 bushels, while the Queensland consumption of malt is from 200,000 to 250,000 bushels. The capacity of the existing operating maltings is approximately 70,000 bushels, but the idle plant at Toowoomba, at present owned by the Wheat Board, has a capacity of 130,000 bushels. The operating maltings have already arranged for their current grain requirements, and it is estimated by growers' representatives that approximately 60,000 bushels of this season's crop remain in growers' hands and for which there is no market. Queensland can, however, consume this barley if it is malted, and if the idle maltings are again brought into operation the State's malting capacity would be approximately equal to our malt needs and a trebling of the production of barley would be justified.

Proposed Barley Board.

SUBJECT to the concurrence of growers, the Government is prepared to constitute a Barley Board under the Marketing Act. An understanding has been reached with the Wheat Board whereby the maltings premises at Toowoomba will be made available to the proposed Barley Board for the malting of the current season's surplus barley free of charge, the new board to have the option of acquiring the premises from the Wheat Board at the end of the present season. The Government will also assist the Wheat Board with the finance required to put the idle maltings in order for treating the current season's crop. An apportionment of this expenditure will be made as between the Wheat Board and the proposed Barley Board in a manner which will be announced in due course. Mr. Devoy, of Castlemaine-Perkins Limited, has agreed to make the services of his head malster, Mr. Redwood, who has had a long experience of malting under Queensland conditions, available to the new board. An offer has been secured from Messrs. Redwood Brothers to malt the barley under contract at the rate of 2s. 4d. per bushel. The Queensland Brewery Company and the Castlemaine-Perkins Company have agreed to purchase the greater portion of the resultant malt, and negotiations are proceeding with the other Queensland breweries. Subject to all these arrangements being consummated by the proposed Barley Board, the Government will place its guarantee behind the contracts between the several parties, and a first advance of 3s. 6d. per bushel of graded barley net at country station can be paid to growers at time of delivery. The Government will also arrange with the Commonwealth Bank for the necessary funds for the board for malting costs, working and other expenses. If matters turn out as anticipated the final return to growers should be an additional 6d. or 9d. per bushel, making a total payment of 4s. or 4s. 3d.

Extension of Barley Growing.

NEGOTIATIONS are in train with the breweries as to the quantities they will take next year. Before the planting season (about March or April next) Mr. Walker expects to be able to announce the guaranteed first advance for a given maximum quantity of barley which will be available to growers in December next, from the crop of the 1930 planting. If the negotiations at present pending turn out satisfactorily it will probably be possible to make the same or a slightly larger advance as is proposed for this season. In establishing new industries and reviving old ones, the danger of over-production for the market available has to be avoided. The Minister proposes, therefore, that the board, if constituted, shall be vested with authority to allocate acreages among growers in the first years of operation; such authority to be exercised in the event of there being any indication of a tendency to over-produce for existing markets.

Proposed Grain Board.

IF approved by the interests concerned, Mr. Walker is prepared to arrange for the merging of the Wheat Board, the Barley Board, and the Canary Seed Board, and their being reconstituted as a Grain Board with a separate committee and separate funds and accounting for each product. Such an arrangement would probably make for economy in administration and co-ordination of effort in the handling, on behalf of the farmers, of the Darling Downs grain crops.

Grain Growers' Responsibility.

IT is emphasised, however, that the question of the desirability or otherwise of establishing organised marketing on these lines is one entirely for the growers to decide. The Government does not wish to thrust any particular scheme upon growers. The Minister was requested by Darling Downs interests to see what could be done to relieve the barley growers of their difficulty and to get the industry on its feet again. Having set out the fundamental facts and also the extent of the assistance which the Government is prepared to give, the matter is left entirely to the interests concerned; but on the basis of the arrangements which the Government has been able to make, it seems that an excellent opportunity now exists for further rural development.

Social Aspects of Agriculture.

SOME time ago in the course of a public address in Melbourne, Sir G. A. Julius, Chairman of the Council for Scientific and Industrial Research, expressed some very interesting thoughts on some of the problems of Australian industry. Discussing some of the social aspects of agriculture, he reminded us that the proportion of farmers to our total population is undoubtedly undergoing a rapid decline. There are many reasons for this, and most of them are quite obvious to working farmers. But, as Sir George points out, if this is a reflection of increasing productivity per worker and progressive elimination of the unfit, it is eminently desirable, but in so far as it represents a falling off in our ability to sell our farm products in foreign markets, the case is not so clear. Other and older countries are experiencing the same decline, in fact it is a recognised world-wide tendency of modern life. Sooner or later, however, a reaction must come; the social amenities and other advantages of country life must prove an irresistible attraction to, probably, even the next generation. Modern discoveries and inventions will all be factors in the improvement of our rural social conditions. Sir G. A. Julius, however, takes a serious view of the present tendency of our rural population to forsake the country and its simpler life for the high and bright lights of the city. He says:—

> From the social point of view, there are potentialities in rural life which nothing else can supply. Farming is the one great industry, or group of industries, still remaining, in which the young man of small means can undertake an independent self-reliant type of life.
>
> It is perhaps not too much to say that the more farms a country can keep busy and prosperous, the sounder will be its social structure.
>
> The peculiar genius of our people traces back to pioneer life. The sturdy individualism which plagues the farmer in some directions is, nevertheless, a quality devoutly to be guarded.
>
> The opportunity to live by one's own direction, to choose a somewhat ill rewarded independence, to remain at a task which calls for skill, care, and judgment, and is inexhaustible in its possibilities for experimental study, is not lightly to be lost. To many men work of this sort is essential to happiness, and the nation needs just such men. The process of attrition of agriculture, which is now going on, is a matter about which we may well fell deep concern, and which calls for the earnest application of constructive statesmanship.
>
> The social aspects of the agricultural problem are by no means confined to the farming population. We must take thought of the place which agriculture is to occupy in the nation's future economy, of the relations between rural and urban populations, of the type of civilisation which we are developing, and how we might mould it nearer to fundamental human ideals.
>
> Shall we permit agriculture to shrink to the status of a minor industry? Is there virtue in having a population rooted in the soil, and distributed fairly evenly over the face of the country, or can we look on with equanimity as that population becomes concentrated in our cities? Are cities and coastal regions to be developed at the expense of back country?
>
> And what of the land, is our heritage to be handed on to future generations unimpaired? Shall we use the land conservatively, or waste it as foolish heirs of a fortune, to the use of which we have not been properly reared?
>
> Will the countryside of the future be green and fertile, or ugly, sere, and barren? To what extent is the denudation of the land of trees responsible for destructive floods and loss of surface soil, and are we not likely to rue the lack of timber we now so recklessly destroy?
>
> These, and similar questions, are not purely rhetorical; some of them open up questions of policy in which different opinions may be sincerely held, but some raise questions of fact to which there can be but one honest answer.

THE QUEENSLAND SUGAR INDUSTRY.

By H. T. EASTERBY, Director of Sugar Experiment Stations.

In this series of articles is incorporated the material for a revision of a Bulletin on the Sugar Industry which Mr. Easterby prepared some years ago. Since then the industry has developed to such a degree, and the conditions have so altered, that a revision has become necessary. At the same time, it is recognised that the sugar industry in Queensland, which supplies 96 per cent. of Australian-grown sugar, is so many-sided and is governed by so many factors that it forms in itself a complicated study of no mean magnitude, and one with which it is impossible to deal completely in much less than a large volume. The industry has also in recent years become bound up closely with both Federal and State policy.

Mr. Easterby has covered his subject thoroughly under several heads, each of which he discusses with all possible brevity while retaining every essential of a very interesting narrative.

Part 1 was published in our January number, in which Mr. Easterby reviewed the development of the industry in pre-Federation days. In this instalment he continues that review.—ED.

PART II.

(a) Short History of the Industry prior to Federation.

(Continued.)

EVEN in the early days of the industry the consumption of sugar in Australia was greater than in any part of the world. About 1878 the consumption was 16 lb. a head greater than in England, which was the next highest. The high consumption in Australia was attributed to the average superior condition of the population, and to the custom at that time of giving rations in part payment of wages, which rations always included sugar.

In 1878 the consumption in Australia was 91,500 tons, and of this one-sixth was produced in Queensland, and one-twelfth by New South Wales. The remainder was imported, chiefly from Java and the Mauritius. Even at that period it was forecast that Queensland would eventually manufacture the whole of the requirements of Australia.

At this time there were no central mills as we understand the term to-day, but there were small mills who bought cane from settlers in addition to their own crops. Many of the larger plantations also bought cane from neighbouring farmers. The price paid in Mackay in 1879 was 11s. per ton of cane showing a density of 10 deg. Beaume, the mill-owner doing the cutting and carting. At Nerang, one millowner gave £12 10s. per acre for one-year-old cane and helped with the cutting and carting, while at Beenleigh up to £22 per acre was paid for two-year-old cane, the seller doing the harvesting and carting. Prices varied considerably, being regulated largely by the proportion of crushing power of the mills to the number of settlers in their immediate neighbourhood. In Bundaberg and Maryborough, many mills were simply crushing plants which sold the resulting juice to a central factory, to which it was pumped along pipe lines after being heavily limed. Some of the

small mills found it profitable to so sell their juice, but the larger manufacturers found they could make sugar more profitably themselves. In 1878, there were sixty-eight mills in operation.

The idea of central mills, however, was kept well in the foreground, and numbers of articles were published advocating the idea and dwelling on the advantages the small growers would reap if the work of cultivating the cane were left in their hands while central mills purchased the cane and did the manufacturing. Mr. Angus Mackay, who was sent as Queensland's Commissioner to the Philadelphia Exhibition, was instructed by the Government to visit the West Indies and make inquiries into this system. On his return, his report, which was published, spoke highly of the advantages that central factories offered, and the agitation, backed up by this report, continued, and eventually resulted in the establishment of a number of central mills in this State, where farmers would not only carry on the growing of the cane but become shareholders in the mills, although the ideas at first were not strictly on co-operative lines.

1880 to 1890.

During this decade the production of sugar in tons varied from 16,660 to 68,924, and further small mills were erected in various parts of the State. It was early in this period that the Colonial Sugar Refining Company (established in 1855) began to turn its attention to Queensland, and purchased freehold land in the Mackay and Herbert River districts, and arrangements were made for the transfer from land owners in the vicinity (all conditional selections). Parliamentary authority had to be procured for this, the company undertaking to erect buildings and appliances for the manufacture of sugar, costing £200,000, and that this sum should be expended within five years. Accordingly, the Colonial Sugar Refining Company's Act of 1881 became law. Some of these conditional selections had been acquired at 5s. and 10s. per acre, and in the debate on the Bill it was stated that such lands were worth three times as much, figures which can be compared with their value to-day. The area of land so to be transferred amounted to 9,305 acres more or less, and if the company did not spend the £200,000 the lands were to be forfeited and revert to the Crown. In less than eight years after the passage of the Bill the company had a total of about 38,000 acres in its three plantations at Homebush, Victoria, and Goondi, about 6,800 acres being under cane, while in the 1888 season over 5,000 acres were actually harvested, cane from a further 1,000 acres being purchased by the company for treatment at its mills. At the end of that season the total capital invested by the company in Queensland was £624,000, of which about £220,000 represented the actual cost of the machinery on the three estates, almost the whole of the latter having been obtained from the United Kingdom.

In the early eighties a high price ruled for sugar, as much as £37 being obtained for first white sugar in 1882. Not long after, though, greatly reduced prices were in evidence owing to the rapid development of beet sugar in Europe, which was being bounty fed, and in 1885 and 1886 the prices were down to £20 per ton, and it was stated that all the plantations were operating at a loss, and at this time a number of small mills went under.

The subject of the establishment of Central Sugar Mills was not allowed to rest, and in Mackay the first steps were taken that ultimately

led to the erection of a number of Central Mills. In November, 1885, a petition was presented to Parliament which subsequently led to the inauguration of the Central Mill system. The petition set forth the difficulties of cane farmers in being confined to mills of plantation owners, and made a powerful plea for assistance by stating that cane growing could be made a white man's industry. Mr. Thomas Pearce, then of Mackay, generally gets the credit for starting the movement which led to the erection of the Racecourse and North Eton Mills.

The Griffith Government in power at that time viewed black labour with little favour, and decided to make available a sum of £50,000 to groups of farmers at North Eton and Racecourse in the Mackay district to erect mills on conditions not greatly differing from those embodied in the subsequent Sugar Works Guarantee Act. These mills were expected to crush cane grown only by white labour, but it was soon found this could not at that time be put into practical effect.

The farmers agreed to take shares, but it was found that shareholders growing cane were receiving less than non-shareholders who supplied cane. The establishment of these two mills with the object of paying to the grower a higher price than he had been getting from the private planter, and having another aim, viz., the supplanting of coloured labour, was naturally not well received by the planters, who were exceedingly critical. The Colonial Sugar Refining Company, however, which had land at Homebush, near Mackay, and had erected a mill, now cut up their estate into moderate-sized farms, and the land was quickly taken up. The small farmer system thus began rapidly to come to the front, and a little later on the Sugar Works Guarantee Act gave further encouragement. It was soon recognised that this system had many advantages, and many of the larger planters began to cut up their holdings and sell farms to canegrowers.

The price of sugar still continued on the low side, and as Section II. of "*The Pacific Islanders Act of* 1885" provided that the importation of any more kanakas should cease at the end of 1890, this led to the cost of kanaka labour increasing, so that matters were not at all satisfactory. This was during the time of the Griffith Ministry, and when later a change of Government occurred it was determined to appoint a special Commission to make a full and searching inquiry into the general conditions of the industry.

This Commission, by its majority report found in 1889 that since 1883 sugars of all classes had fallen in price, and this was the principal reason for the depression; further, the cost of black labour had increased by more than 50 per cent. since 1883, and this, concurrent with the low price of sugar, had caused working expenses to exceed the value of the produce. The Central Mills of Racecourse and North Eton had not done well, and unless further subsidies were granted they must inevitably close. At the same time, the Commission recognised that it would be best that the business of growing sugar should be separated from manufacture. It was their opinion also that if all coloured labour was withdrawn the extinction of the industry must quickly follow, and they recommended that the introduction of this labour be permitted for some years longer than the period fixed for its ceasing. So in 1892 the section prohibiting the further entry of kanakas was repealed by a new Government, and kanaka labour thus re-established remained till the days of Federation.

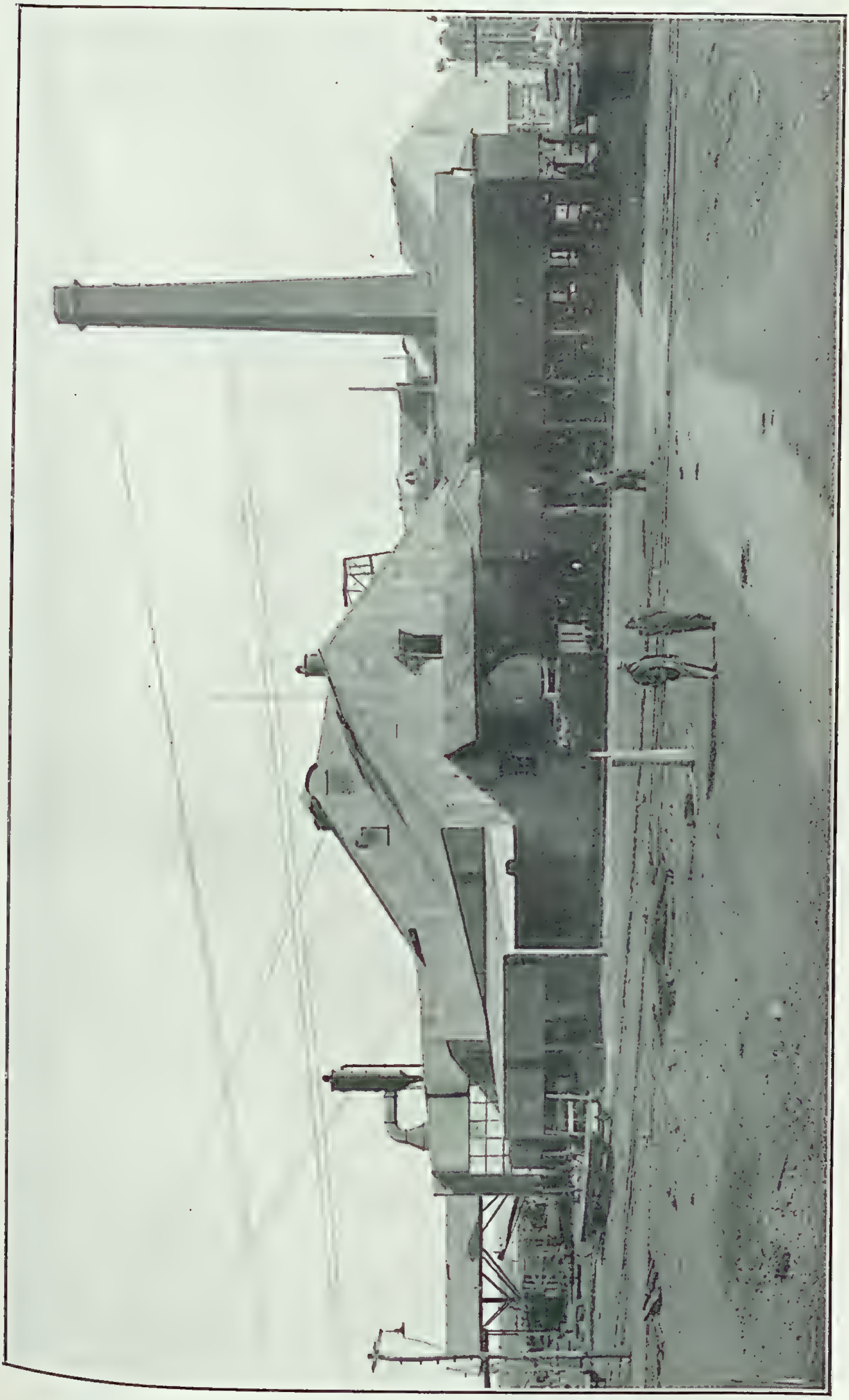

PLATE 37.—RACECOURSE MILL, MACKAY.

The next year, 1893, was an important one to the industry, as "*The Sugar Works Guarantee Act of* 1893" became law. By means of this measure the following Central Mills were ultimately erected:—

> Marian, Pleystowe, Plane Creek, Mackay; Proserpine, Proserpine; Mulgrave, Cairns; Mossman, Port Douglas district; Gin Gin, Bundaberg district; Isis, Childers; Mount Bauple, Maryborough district; Moreton, Nambour; Nerang, Southport district.

All these mills, except Nerang, are still working to-day.

No restriction was imposed by the Act with reference to the labour to be employed. It was asserted that this Act was the salvation of the Mackay district, and indirectly resulted in considerable revenue being derived by the State. It also caused the settlement of a large number of small growers in various parts of the colony.

Of course, the establishment of Central Mills was not unattended with difficulty, and it took much time before they were in actual operation. In some cases mills were erected before sufficient cane had been grown; other drawbacks were that landowners required too big a price for land, while some mills had to pay high rates for tramway easements.

In the case of the North Eton and Racecourse Mills which were erected before the passing of the Sugar Works Guarantee Act, provision was made for Government control, and the directors were divided into A directors (5) and B directors (4), the A directors being nominees of the Government. In the case of the mills under the Sugar Works Guarantee Act, the growers offered their land on mortgage as security for the advances made for building the mill and tramways. The Government held the deeds of the lands, but the growers had the sole management of the mills' affairs. The Act made no provision for Government control except in the case of a mill making default.

Reverting to the Racecourse Mill at Mackay, this was the first Central Mill erected to crush cane in Australia, and it was claimed that its foundation was the commencement of the White Australia movement in sugar. It was also the first mill owned and controlled by farmers to pay off its liability to the Government. In 1887, when the question of farmers' mills was first brought up, there were thirty-one mills in Mackay alone, and dissatisfaction was rife amongst the growers as to the treatment they received in the matter of price.

The price paid by Racecourse Mill at its first crushing was 12s. per ton for plant cane and 11s. for ratoons. The varieties principally grown at that time were Malabar, Striped Tanna, Black Tanna, Black Fiji, Meerah, and Rose Bamboo.

In 1891, the tonnage of cane required to make a ton of sugar at this mill had been reduced from 11½ tons to 9, and the sugar was sold to the Colonial Sugar Refining Company at an average price of £12 6s. 5½d. per ton, growers receiving 13s. 6d. per ton for cane. Finances, however, were at a pretty low ebb. The manager only received £250 per annum, and a proposal to increase his salary by £50 pretty nearly wrecked the directorate.

Under the 1893 Sugar Works Guarantee Act, about £500,000 was advanced by the Government for the erection of Central Mills. The original loans made by the Treasurer of Queensland were for a period of fifteen years, and valuations were made by a Government officer as provided by the Act. Provisions were embodied that if the mill made default the Treasurer could fix the price of cane and that the Treasurer could enter into the possession of the sugar works and all lands mortgaged.

Before the advent of the Central Sugar Mills, the old plantation methods with the kanakas resembled portions of the old world where the feudal system established communities whose schools, churches, and places of abode were practically under the control of one person. During the building of the numerous small mills artisans found employment for the time being, but after that the white staff of a plantation would consist only of overseers, clerks, and storekeepers. The capitalist alone was able to cope with pioneering difficulties in sugar-growing and manufacture. With the change in the conditions introduced by the Central Mills came a very decided alteration in the personnel of the people engaged in it. Instead of about fifty planters in a district, 800 small farmers took their place. The overseer of a gang of, say, sixty kanakas, was replaced by half a dozen farmers employing four kanakas each. The small men, in many cases labourers, who then entered on canegrowing were raised in the social scale to employers and finding themselves so, improved their opportunities. With the introduction of the Central Mill system, farmers became to some extent manufacturers and accustomed to supervising important businesses. These communities had their churches, schools, school of arts, sports and rifle clubs. The whole tendency was to eliminate the large landlord and create a type of reliant self-made men.

The kanaka days, however, were not without their humorous side. The boys would have feasts and sham fights, showing great proficiency in throwing grass spears. If they were late in turning out in the mornings they would often get a kick from an irate boss or overseer, but they mostly bore it smilingly. Their humpies or huts were in many cases built of grass and cane tops and trash, and it was not uncommon for a fire to happen at night time and then pandemonium would be let loose. There would be no hope of saving the structure, and the boys would be yelling like maniacs, and in many cases crying, with good reason as they often had money in the shape of notes hidden in the straw walls. When lined up for medical inspection it was amusing to hear the kanakas account of the various things that he considered were the matter with him or his "Mary" when he was married, and the dispenser at the mill hospital could tell many funny stories of life in the kanaka quarters. Occasionally, real battles would be fought between different island boys, and a death or two sometimes happened. The "boys" in many cases had horses, rode bicycles, held football and cricket matches, and generally, enjoyed life. On the whole they were well treated and had their protectors in the shape of Government officials who saw that they were properly looked after. There was scarcely any intermarriage with the whites. Of the half caste population in Queensland, in 1901 less than 2 per cent. were of Polynesian extraction, while the percentage of Chinese was almost 30. The total half caste population of the State at that time was 2,177, including aborigines. No kanakas were employed in the Central Sugar Mills.

The advent of the Central Mills led to a great decline in the number of private manufacturers, and to-day there are no sugar-mills operating owned by a single person.

Two of the small mills in the Beenleigh area are of the type of the old plantation small mills once so numerous in the colony of Queensland, and except that coloured labour is no longer employed and certain improvements in manufacture have been introduced, they would give a good idea of what the old mills were like.

[TO BE CONTINUED.]

Bureau of Sugar Experiment Stations.

CANE PEST COMBAT AND CONTROL.

The Director of the Bureau of Sugar Experiment Stations, Mr. H. T. Easterby, has received the following report, for the period November to December, 1929, from the Entomologist at Meringa, Mr. E. Jarvis:—

Visit to Freshwater.

On 8th November the canefields in the vicinity of Jungara, Freshwater, Redlynch, &c., were searched for further evidence of the occurrence of *Ephysterus chersæa* Meyr. the small "tineid moth borer" of cane, which during September last was found to have attacked young ratoon shoots in this district. Apparently, however, Mr. McDougall was unable to find further signs of such damage.

Outwardly, the nature of the injury caused by *E. chersæa* corresponds in general appearance with that of our large noctuid moth borer (*Phragmatiphila truncata* Walk.), viz., destruction of the central or heart-leaves.

When first discovered and described by the present writer in the year 1919 it occurred at Pyramid, Meringa, Kamma, and Gordonvale, but has since spread to other widely separated localities. A full description of this moth and of its caterpillar, &c., will be found in Bulletin No. 11 of this office (Div. of Entomology, Bureau of Sug. Expt. Stations).

Attention has already been drawn to the fact that, not being an indigenous species, but having—in the opinion of Dr. Guy A. K. Marshall of the British Museum—been probably introduced into Australia from Natal, it is quite possible that, in the absence of its own natural enemies and other controlling factors, this insect might, in a new country like Australia, increase abnormally and become troublesome to our growers in the near future. In India this species is known to bore the stems of rice plants and various native grasses.

The Cane Beetle Situation at Meringa.

Up to date (17th December) no general emergence of cane beetles has taken place at Meringa, and we may reasonably assume that the prolonged dry conditions being still experienced here are likely to operate as a severe natural check on the numerical increase of this pest throughout drought-stricken areas.

It is interesting to record that the rainfall at Meringa during the last eight months of April to November has been only 7.88 inches; while the average for this period for the last forty years is 30.70 inches.

In addition to the beetle or imago condition of this cockchafer having been adversely affected by such climatic conditions. other controlling factors happen to have operated this year as a hindrance to normal development of its pupæ in the soil, so that around Meringa, at any rate, little damage should be experienced from grubs of this pest during the coming season.

Greyback cane beetles, however, made their appearance as usual at Gordonvale, Babinda, and other places early in November, when they were observed by the writer flying freely to electric lights in the immediate vicinity of the Mulgrave mill. At the residence of the electrician, Mr. F. P. Bell, where numerous specimens of these cockchafers were attracted to veranda lights of about 100 candle power, additional evidence was afforded in connection with the phototropic reaction of this species. Response to such light was at first of a very positive nature, the beetles being violently attracted, although often failing to reach their objective owing to ill-directed flight. In such cases they would fall to the ground, and, after crawling with rapid shambling motion for a few seconds. mount upwards and again endeavour to reach the centre of illumination. Such positive activity, however, generally lasted but a minute or so, the beetle then becoming quite motionless and unresponsive to phototropic influences.

This sudden reaction appeared very remarkable when occurring in insects which a moment before had been all aquiver with intense desire to plunge into the midst of such brightness.

It was noticed, too, that specimens while in this sleepy condition would remain without movement for hour after hour, although in some instances chancing to be settled only 3 or 4 inches away from an electric lamp.

Reaction of this nature would appear to be very similar to that induced by sunlight, seeing that these cockchafers rest in the daytime on the leaves of their feeding-trees, at which times they are usually in a torpid state and more or less motionless.

Distribution of Tachinid Flies.

Several liberations of this useful dipterous parasite (*Ceromasia sphenophori*) have been made during the last few weeks in the Goondi area. In each case, the living flies were taken to the borer-infested field in glass tubes by Mr. W. A. McDougall, of this Experiment Station, and liberated at spots where borers were most in evidence.

The various farms selected for further liberations are being planned by Mr. R. N. MacLean, the Field Chemist at Goondi mill; our intention being to collaborate with him in the work of systematically distributing these parasites throughout this canegrowing district.

Visit to the Herbert River.

On the 9th instant Mr. McDougall was instructed to proceed to Ingham, and, whilst there, to get into touch with the representatives of the various canegrowers' branches at Cordelia, Upper Stone River, Hawkins Creek, Macknade, Ingham, and Long Pocket. While visiting the district, inquiry will be made regarding the occurrence of primary cane pests at the different localities coming under observation.

During the flighting season of greyback cockchafers, and of other related scarabæid cane beetles, living and pinned specimens will be collected, the former for breeding at this Experiment Station, the latter for inclusion in our official collection of dried insects.

Certain data, also, in connection with grub and beetle borer damage, presence of moth borers, rat damage, &c., will be obtained for future reference and consideration.

ENTOMOLOGIST'S ADVICE TO CANEGROWERS.

Wireworm Damage in Evidence.

Cases of injury to young ratoon cane from attacks of wireworms have been brought under our notice during the last few weeks. Many of the stalks in such affected shoots are observed to wilt, turn brown, or dry up, and upon examination will often reveal the presence just below the surface of the ground of an irregular cavity which has been gnawed through the soft rind, and may in some cases extend to the centre of the shoot, thus bringing about death of the heart-leaves.

The larvæ of Click beetles, which are often termed wireworms, are long, more or less cylindrical in shape, and of narrow, even width, something like the shape of a small earthworm; the body being usually firm, glossy, and yellowish in colour.

When handled they slip easily from between the fingers. In most species the beetles are obscurely coloured, being uniformly dark-grey or blackish. When laid on their backs on a flat surface they are able to spring into the air and regain their footing, by means of violently jerking the body downwards on the hard surface.

Control measures are usually directed against the beetles. A bait made of chopped grass dipped in a solution of sodium arsenite and molasses (1 lb. arsenite, 8 lb. molasses, in 10 gallons water) has been found effective. The beetles should be collected from such baits soon after nightfall. Commonsense remedies are to increase the humus content of infested soils; while ploughing deeply collect the wireworms by hand before planting, and thoroughly drain and work the land when necessary, this control measure being of great importance on land which happens to be low-lying and badly drained naturally.

Cane Grub Control.

First-stage grubs of the "greyback" cockchafer will still be feeding at the beginning of this month, when they will change their skin and commence the second instar, during which, when numerous, they are able to cause serious damage to cane growing in light friable soils.

In order to distinguish between these moults of the grub stages of this cane beetle growers need only examine the head, which, unlike the body, does not alter in size after each succeeding moult. The width across the head in grubs of the first instar is $\frac{1}{8}$ inch, in the second stage $\frac{1}{4}$ inch, and in the third stage $\frac{3}{8}$ inch.

Keep the soil on areas liable to grub-infestation moving, at frequent intervals if possible, between the rows of young cane, during the month or five weeks occupied by the first larval instar, especially when the surface happens to be caked after heavy rain. Go as deep and as close to the plants as can be ventured without incurring risk of injury to main roots. Such treatment, in addition to promoting vigorous growth of the stools, tends also to destroy a certain percentage of the small first-stage grubs of this pest, and by opening the surface soil enables ants or other small enemies to reach them.

Growers are advised to maintain clean cultivation on land being reserved for early planting throughout the flighting season of the beetle, as a dense growth of weeds, &c., between cane rows often attracts egg-laden females of both the ''grey-back'' and French's cane beetle, the latter being very fond of ovipositing in such places.

CANE PESTS AND DISEASES.

The Director of the Bureau of Sugar Experiment Stations, Mr. H. T. Easterby, has received from Mr. R. W. Mungomery, Assistant Entomologist at Bundaberg, the following notes (17th December, 1929) having reference to cane grub infestation in the Bundaberg and neighbouring districts:—

Notes on Grub Infestation.

It is rather significant that many of the farms in the Bundaberg district which have suffered from the ravages of grubs during the last spring have been those on which, or adjacent to which, it has been the custom to ratoon the cane over a long number of years. Old ratoon crops have in most cases suffered the severest damage. The losses incurred through the death of the stools from grub attack do not, in such cases, constitute the sole loss, since another factor enters into the question; that is, the fact that these old ratoons aid in perpetuating the grub pest, and are the means of spreading the infestation to younger blocks of cane nearby, which likewise suffer a considerable amount of damage.

Why Grubs Disappear.

In many instances it is true that some areas which formerly were notorious for grub damage are now almost free from this pest, or, at most, suffer no appreciable damage. This is most likely due to the combined action of insect parasites, predators, and diseases, both fungus and bacterial, all of which combine to keep the grub population down to very small limits. On the other hand, some areas previously free become infested, and once grubs become established in large numbers on a farm they usually remain troublesome over a period of years until the natural controlling agents increase sufficiently to reduce their numbers and restore the balance of nature. In areas such as these where growers know that their own or neighbouring farms have been infested within recent years, they should be forewarned and not allow their crops to ratoon too many times. After harvesting the second ratoon crop would, in most cases, be a good time to plough out and prepare the land for another crop. Although the writer is aware that in this district ratoon crops are, generally speaking, less costly to grow than plant crops, and also that growers often like to ratoon as long as they can profitably produce a crop, it is a case of false economy when by so doing they encourage grubs to increase unchecked.

The Rate at Which Grubs Increase.

In support of the above, the following example of the rate of increase of grubs will, no doubt, be of interest to those growers who have not yet become familiar with this side of the question. Take the case of a pair of large grubs which are below plough level, and therefore remain in the soil during the course of its preparation for spring planting. They change that year into the pupal and adult stages, and, assuming an equal sex ratio and reinfestation, thirty eggs are laid

which, on hatching out, give rise to thirty grubs to infest the plant crop. Again, disregarding for the present deaths from natural enemies and infestation from outside, both of which factors, however, do operate, these grubs within a two-year life cycle remain over into the first ratoons, which they damage when young. In the following year they change into beetles, and the grubs resulting from these thirty beetles will then amount to 450, which will do a vast amount of damage to the young third ratoon crop, and would most likely completely destroy it. This demonstrates the fact that by hand-picking and carefully cultivating the ground so as to rid it of grubs previous to planting, the infestation up to the second ratoon crop may be kept reasonably small; but by carrying on the practice of ratooning any further, this encourages a relatively heavier infestation of grubs in succeeding crops, which are in danger of being eaten out. This, therefore, gives every justification for recommending that, in grubby areas, the cane crop should, as far as is reasonably possible, be ploughed out after harvesting the second ratoon crop.

The Director of the Bureau of Sugar Experiment Stations, Mr. H. T. Easterby, has received from Mr. A. N. Burns, Assistant Entomologist at Mackay, the following report (17th December, 1929) for the month ended 12th December, 1929:—

Occurrence of Set Boring Grubs (*Pentodon Australis* Blkb.) in Racecourse Mill Area.

During the past month several fairly extensive outbreaks of grub damage to young plant cane were brought under the notice of the Experiment Station, and when inspections were subsequently made of the affected areas the injury was found to be caused by second and third-stage grubs of the *Pentodon* beetle. The chief damage was observed in farms quite near the mill, but also on several farms at Te Kowai, Walkerston, and Homebush, minor infestations were noted.

The injured cane presented a similar appearance to that damaged by grubs of the frenchi beetle, though the heart-leaves were more withered then they usually are when greyback or frenchi grubs are at the roots; this is no doubt due to the fact that grubs of this beetle invariably bore into the shoots below ground level or else into the sets themselves. Unlike the other two abovementioned species they are not very partial to the fibrous roots of the cane. In some instances as many as four and five third-stage grubs were found inside the sets, some had entered through the cut ends, whilst others had bored through the rind into the interiors of the sets. Holes made by these grubs were usually quite round, and their tunnels may be several inches in length.

On account of the prevalence of this insect at times in the Maroochy River district, near Brisbane, and its characteristic habit of boring into shoots and sets, it has received the appropriate name of the "Black Stem Gouger." The adult beetle is jet black, hence that descriptive part of the name.

The life cycle of this insect is comparatively short, and there are probably several generations of it produced in a year, though only one main one because most of the eggs are recorded as being laid during the spring months, thus producing the generation at present active in canefields. The three stages of the grub are passed through in the space of a few weeks, and the pupal stage occupies about three weeks only.

In nearly all the patches affected on the farms inspected, also on the Experiment Station where a few of these grubs were discovered, the infestation was confined to hollows in the fields, or else to areas where silt had been deposited by rain water, and therefore naturally low areas.

Outbreaks of this pest do not appear to be general every year; they seem to occur every few years with a comparative scarcity during the intervening years. The beetles themselves are not very frequently noticed on the wing, odd specimens are sometimes attracted to artificial lights. This beetle is recorded as being rare in the Cairns district, but occurs freely in the Mackay, Bundaberg, Maryborough, and Brisbane districts. Besides being recorded as a cane pest in Queensland, this species also attacks the roots of corn, both in New South Wales and some parts of Queensland. There are several other related species belonging to the same genus (Pentodon) which are recorded as being injurious to various root crops in other parts of the world.

A brief description of the fully-fed third-stage grub is as follows:—Length, in natural curved position, ⅞ to 1 in. (about 22 mm.), width of head 0.2 in. (5 mm.), body whitish-cream with abdominal segments dirty bluish-black. Dorsally the tops of the curves of each body segment and the inter segmental ridges carry several (from 2 to 4) tranverse rows of short dark-brown bristles. Spiracles brown, a pair on each of segments 1 and numbers 4 to 11. Legs pale yellowish brown, joints 2 and 3 carrying a number of long brown hairs. There is no distinct anal path; the anal segment carries on its ventral surface a patch of dark-brown bristles, about 110 in number. Those following the anal suture (numbering about 10 on either side) are much longer than the other bristles. Head dark-brown, mandibles very dark-brown at base becoming quite black towards and at the extremities. Labrum dark brown-black. Antennæ brown, devoid of hairs.

The pupa measures about ⅞ in. in length; when newly changed it is creamy yellow in colour, darkening to brown as development progresses. Abdominal segments sharply defined, eight visible dorsally, and forming a slight ridge along the middle of the dorsal area. The junctions or sutures between these segments from numbers 1 to 5 have a small dark-brown inverted V-shaped marking (slightly flattened) at their medians. The tip of the anal segment carries a small cleft brownish marking.

The adult beetle measures about ⅝ in. in length (16 mm.) and is of a uniform shiny black colour above. The ventral surface, particularly in the coxal sutures and near the outer edges and segmental junctures, is reddish-black. The portions of the legs extending beyond the body are black and thick set, also moderately hairy. The antennæ are dark reddish-black.

To date outbreaks of this insect have not really been extensive enough to warrant fumigation, but this method of control could be carried out if necessary and in precisely the same manner as for grubs of the greyback beetle. As the areas subjected to attack are usually small, replanting with sets (whilst wet) that have been dipped in a solution of sodium arsenite, molasses, and water has been recommended. Further injury is not likely to occur from the present time onwards, because now all the grubs are practically in the pupal stage; and the other generations produced at times other than the spring months do not appear to cause much injury. In the Bundaberg district it was noticed that where thin sets had been planted they suffered the most, doubtless owing to the lack of reserve nutriment for the shoots and roots. Where thicker sets had been planted the effect on the cane was not so bad, and new shoots developed from the bases of the original ones.

Occurrence of Sugar-cane Aleurodid or "Snow Fly" (*Aleurodes berghi?* Sign.) at Farleigh.

Some two weeks ago numbers of this small insect were observed in a field of plant cane E.K. 28 and Q. 813, and about 2 miles from the Farleigh mill. A considerable number of plants were attacked, and the injury inflicted by these aphid-like insects combined with the extremely dry weather conditions had caused a considerable amount of yellowing of the plants.

These insects secrete a saccharine-like substance which is greatly attractive to some species of ants, which in consequence swarm over the Aleurodids to obtain this sweet substance. These ants no doubt form a natural protection to the former from parasitic insects, &c. The ants attending the specimens observed were a small black, long-legged, active species, probably belonging to the genus Cremastogaster, which contains a number of ants that are found in company with aphids, hoppers, larvæ, &c.

Very little appears to be known regarding the life history of this insect which appears to be identical with a species that commonly attacks sugar-cane leaves in Java.

The eggs are laid in groups on the under surface of the cane leaves, invariably the older leaves. The young larvæ on emergence "form oval glass-like cases of different colours and feed inside these and finally pupate there." (Froggatt, Ent., N.S.W.)

The adult insects are very active, and when disturbed spring out and fly from the cane. Whilst feeding they congregate in little groups on the undersides of the cane leaves and amongst the larval cases, eggs, &c. In this position the wings are kept folded tent-like over the back which gives the insects a triangular appearance. The total length in this position is about 1.75 mm. With the wings expanded they measure approximately 2.5 mm. The forewings are greyish white with two distinct and one obscure black transverse bands across them, the obscure one being situated between the other two. These bands are intercepted by a longitundinal vein which runs the entire length of the wing, almost centrally. The two distinct bands are situated one near the base of the wings and the other in the sub-apical area. At the

end of the central wing vein on the outer edge is a small black spot; there is also another minute black spot almost at the base of the wing in the lower hind margin below the median vein and between the first two transverse black markings. The hindwings are much smaller than the forewings and are semi-transparent whitish. The head, thorax, and abdomen are dark-greyish with a bluish tinge, and the legs are brownish.

Attacks by this insect have so far never been recorded as having been severe enough to call for control measures. As it is, the outer and consequently older leaves of the cane shoots only are attacked, therefore a fairly easy and efficient control would be to simply cut these off, which would not injure the plants, and burn them. By this method no doubt many adults would escape, but all eggs, larvæ, and pupæ would be destroyed.

The following report (30*th December*, 1929) *from Mr. W. A. McDougall, the Assistant to the Entomologist, Meringa, has been received by the Bureau of Sugar Experiment Stations*:—

Attempts to establish tachinid flies in the Herbert River district have not been successful. Under 1 per cent. of sticks is infested by borer; much too small an infestation to support flies.

Of the minor pests, the "army worms" do very little damage, and "deadhearts" are noticed occasionally. The false wireworm (*Gonocephalum carpentariæ* Blkb.) was reported as attacking cane during February and March of this year. The damage from this beetle, in these instances, would not necessitate control measures as given on page 34 of Bulletin 3, Revised Edition 1927 (Bureau of Sugar Experiment Stations).

As in other northern mill areas the grub damage, during the early part of this year, was the heaviest for many years. Most of it was confined to the Hawkins Creek (Macknade mill) and Upper Stone (Victoria mill) districts. The weather conditions during the past six weeks have given beetle emergences (from the ground) a severe check. About 6th December at Hawkins Creek and 27th November at Upper Stone would see the beginning of much lighter flights than those of last year. Elsewhere in these mill areas "greybacks" are comparatively scarce. There were numerous Christmas beetles (*Anoplognathus boisduvali* Bois.), called the "Golden Beetle" by the farmers on the Herbert, and *Repsimus æneus* Fab. ("Blue Beetle") resting on Moreton Bay Ash or Poplar Gum. Near Halifax single specimens of *Anoplognathus smaragdinus Ohaus* (female) and of *Calloodes rayneri* Macleay were shaken off a tea-tree and off River Hibiscus (*Hibiscus tiliaceus*), called "fourpenny" tree by the farmers. Of these four species of beetles the first is known to damage cane, but only under exceptionally dry weather conditions. One farm suffered from grub damage during September of this year. It appears that grubs of *A. boisduvali* were responsible. There are still some third-stage grubs of this beetle to be picked up alive, while it is evident that many have been destroyed by Campsomeris wasps. Pest destruction funds are, as usual, paying for beetles collected. Unfortunately, the two districts which suffered the damage from grubs during the early part of this year cannot pay for beetles at present. Most of the funds were spent combating other pests. Early next year those in charge of this type of work in the Herbert River district hope to put in trial fumigation plots against the "greyback" grubs. From the nature of the flights it would seem that extensive digging will have to be done and careful selections of localities made for these trials to serve their purpose.

Thanks are due to field officers of Macknade and Victoria mills, the secretary of the H.R.D.C.G.A., and several farmers for help given and information supplied.

THE JOURNAL APPRECIATED.

Renewing his subscription to the "Q.A.J." for another five years, a Cooroy farmer writes (2*nd January*, 1930):—

"We appreciate its help; receive profit from its instructions; enjoy its pictures; and admire its literary quality. We look for its coming every time."

ARMILLARIA ROOT ROT.*

By J. H. SIMMONDS, M.Sc., Plant Pathologist.

Armillaria mellea, commonly known as the honey fungus on account of the characteristic colour of its mushroom-like fruiting stage, is one of the comparatively few fungi which are well able to adapt themselves to either a saprophytic or parasitic habit of growth. Normally this fungus lives as a saprophyte on old decaying roots, stumps, &c., but should it come in contact with the root of a suitable living host it can attack this, usually per medium of some injury, and cause extensive rot which very often ends in death.

As a parasite the fungus is capable of attacking many different hosts belonging to widely separated groups of plants. In Europe, considerable loss occurs in the pine forests as the result of the rotting of the roots and base of the trunk by this fungus. In America many native and introduced trees may be attacked. In Australia Armillaria root rot is found affecting, in many cases to a serious extent, citrus, deciduous trees, especially the apple, and the grape. The potato is also sometimes attacked, and is noteworthy as being one of the few herbaceous plants affected with the disease.

SYMPTOMS.

Unfortunately this rot is a somewhat insidious disease, and considerable damage may be done to the underground parts of the plant before the symptoms resulting from this are sufficiently marked to be noted. An affected tree usually exhibits a stunted condition of growth, a yellowing of the foliage, and possibly more or less dieback. Branches on one side having for their source of supply one or more attacked roots may exhibit these symptoms to a more marked extent. Frequently the tree when approaching a dying condition will throw an abnormally large crop of fruit as a last effort to perpetuate its species.

Should any such symptoms be observed, the soil should be removed well away from all the main roots and a careful examination made for signs of Armillaria invasion. This will be indicated by more or less extensive areas of soft rotting bark, which may be easily stripped off, and yields a characteristic mushroom odour. White felt-like wefts of closely interwoven fungal threads may sometimes be observed lying between the bark and the wood.

The most characteristic feature is the presence of shiny-black or dark-brown string-like fungal strands or rhizomorphs. These rhizomorphs are specially modified structures developed to enable the fungus to resist the adverse conditions of desiccation, &c., met with during its life in the soil. Each strand consists of an outer resistant layer or cortex formed of closely interwoven fungal threads or mycelium, which are intimately fused with one another to give a cellular structure resembling that found in the higher plants. The central portion consists of more loosely woven mycelium, and is known as the medulla.

In citrus the black rhizomorphs lie more or less embedded in the softened bark or else radiate out as free, branched strands. In the former case they may appear merely as short black irregular streaks protruding from a crack in the bark, or they may be entirely superficial though firmly attached (Plate 38).

* Reprinted from "Pests and Diseases of Queensland Fruits and Vegetables," by Robert Veitch, B.Sc., F.E.S., and J. H. Simmonds, M.Sc., published by the Department of Agriculture and Stock, Brisbane, 1929.

Plate 38.—Orange Root attacked by *Armillaria mellea.*

In the apple and most other fruit trees the rhizomorphs are free and appear as black strings more or less tangled round the roots. These are attached at various points, and from these the fungus extends out into the bark and woody tissue of the plant.

The rhizomorphs are capable of growth from their free ends for considerable distances through the soil, and it is largely by this means that the spread of Armillaria takes place.

Armillaria mellea belongs to one of the highest groups of fungi, the Agaricaceæ, which includes those of the mushroom type. During a period of wet weather in the autumn the fruiting bodies of this fungus may appear in clusters round the base of old rotting stumps, &c., or beneath fruit-trees badly affected with the disease. These structures are of the ordinary toadstool shape, and have a yellow-brown or honey-coloured stalk and disc, the latter being speckled over with small brown scales. The gills on the under surface of the disc are white and distinct. Covering the outside of each gill is the layer known as the hymenium. This consists of closely packed club-shaped cells, some of which project somewhat further than their neighbours and develop on their apex four short peg-like projections, on each of which is developed a minute rounded basidiospore. Many millions of these spores may be produced in a day by one toadstool.

The basidiospores germinate and are able to infect decaying wood with which they may be associated and thus serve to extend the saprophytic activities of the fungus. Apparently the living plant becomes infected only when attacked by one of the rhizomorphs. In a new orchard these have been previously developed upon rotting remains of scrub and forest trees left in the ground during clearing operations. Usually the fungus gains entrance through an injured or dying root or through one which is closely associated with the original rotting material.

CONTROL.

If possible, land which is to be used for orchard purposes should be well stumped and have all the main roots removed by thorough and deep ploughing. Annual crops, other than potatoes which are also affected, could be planted for a year or more in order to allow time for the fungus to die out of the soil.

If a preliminary inspection has shown a tree to be attacked, the soil must be removed well away from the crown and main roots so as to expose them to easy access. Any badly rotted roots are then removed entirely. Others less extensively attacked must have the affected areas thoroughly cut out until sound tissue is reached, after which Bordeaux paste should be painted on the wounds. Any diseased material will of course be carefully collected and burnt. The pieces may be conveniently gathered by laying a piece of paper under the scene of operations. The main roots should be left exposed to the beneficial action of the sun and air for as long as the absence of frosts will permit. This treatment is usually effective only if the disease is caught in its early stages before the fungus has pentrated too deeply into the wood.

If a tree is too badly diseased for remedial measures to be a success, it should be carefully removed together with all its roots, and should be burnt on the spot. If the original stump or root from which infection started can be located, this also should be dug out and burnt.

The affected area is then best isolated, to prevent the spreading of the fungal rhizomorphs through the soil to healthy trees, by digging a trench 2 feet deep round the outside of the furthest root extension of the diseased one. The soil within the trench should be repeatedly turned over and exposed to the sun. Replanting should be delayed for two or three years, otherwise there is a chance for the new tree to become infected from rhizomorphs unintentionally left in the ground.

RURAL LIFE IN OTHER LANDS—IX.

By the EDITOR.*

HIGHWAYS IN HOLLAND.

So unique are its problems, so industrious are its people, and so interesting is the country generally that one was tempted to stay a little longer in Holland after leaving Germany and before going back across the border into Belgium and down once more along the pleasant roads of France where the sun is sometimes seen for at least two successive days.

Nature only gave the Dutchman a sporting chance to settle and develop his country, and how slender that chance was can be imagined when it is known that, but for the long lines of dykes that dam back the sea, any high tide would swamp nearly 40 per cent. of the total land surface of the country. Miles and miles of embankments are also necessary to hold in channel the river waters which, uncontrolled, would flood vast tracts of what is now, more or less, dry land.

The eternal battle of the Dutch farmer is to keep his head literally above the water—we would welcome some of his complaint in parts of Queensland—and the story of his age-long fight against that element is one of the most inspiring in human history. That he has succeeded against such heavy odds is a tribute to characteristics of invincible pluck, dour determination, and an unbeatable spirit that arouses at once one's admiration.

A Nation Built Out of a Bog.

"He who cannot keep out the water doesn't deserve the land" is the principle on which the man of Holland built his nation up out of the bog. The immensity of the problem is evident when it is realised that most of the country is below sea level, so ordinary drainage was out of the question. To meet this difficulty (a very serious one in a wet climate) a system of uphill drainage was devised. This is how it was done: When it was decided to reclaim a water-covered area a dyke was built round it. Windmills of sufficient power and dependability were erected and a series of canals constructed. By wind power the water in the drains on the lowest levels was lifted into higher ditches, until finally it was delivered into a high-level canal with an outlet to the sea.

I saw a device on something like the same principle, but of different mechanism, at a place called La Louviere, near Mons in Belgium, where it is necessary to lift fully-laden barges from a low-level canal to a high-level channel. The lift was something like 30 feet. Though it seemed an impossibility to a layman at first glance, yet it was quite simple in practice. It was done in this way: The barge was floated into a lock or tank with doors or gates that could be sealed and made water-tight at both ends. As soon as the gate entrance to the lock was closed the mechanism was brought into action. This was governed by hydraulic power and the lock or tank, with its loaded barge afloat on the impounded water, commenced to rise slowly on great steel shafts on a principle similar to that employed in the operation of old-fashioned hydraulic lifts in lofty buildings. On reaching the limit of elevation the other gate of the lock was released and the laden barge floated out into the canal on the higher level to sail majestically on its way. All through the Low Countries, in Holland particularly where most of the country's transport is by water, one often experienced the illusion of barges sailing placidly through green-grassed fields without being water-borne. This illusion was heightened when the canals were high above the bordering land levels.

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* In a Radio Talk from 4QG.

What the water question means to the Dutch people, particularly the Dutch farmer, is expressed in the fact that one of the most important of public offices is the Waterstaat which supervises generally the means of countering the constant problem of how to get rid of unwanted water.

A Land of Ordered Beauty.

Every highway in Holland—they were cobbled with stone cubes like the old familiar road to Armentieres—seemed to be bordered on either side with a canal and a row of trees. Through towns and villages the canals flowed and into them was dumped all household refuse—in fact, the canal seemed to take the place of the compost heap in every French and Belgian back yard, and neither Kingfisher Creek nor Upper Breafast Creek could compare with them in strength and power of smell. But in spite of it all, on figures, Holland is one of the healthiest countries in the world, though at least one cynic has remarked that the slow-moving, almost stagnant water in the canals of Holland is so bad that even microbes haven't a chance to win a living in it. That is, however, by the way.

Perhaps, because it seemed so different from any other environment that one had known, that one learnt to appreciate the ordered beauty of rural Holland. Well cared-for trees lined every roadway and bordered every canal. Through the trees one saw fields as flat and fresh as bowling greens. No fences or hedges broke the vista, trenches formed the dividing lines between the farms. Canals and ditches criss-crossed the landscape.

Where Everybody Works.

Everyone seems to work in Holland—I am speaking now of the country—not of its cities, where poverty, the bitter struggle for existence and heart-breaking unemployment are much what they are like in the centres of population of other European countries—and everything seems to have a definite utilitarian value. The farmhouses seem to have been built on a uniform plan—square, solid brick structures with high pitched roofs—the space under the roof being generally used as a hay loft. Cattle are housed in winter in an extension of the dwelling and practically under the same roof. The winter quarters of the stock are kept scrupulously clean. The cattle are housed from November until April, and for the rest of the year are milked in the open. It is a common sight to see the cows milked alongside the road without bails; leg-ropes are used, but in a different way from our practice. The animal's legs are tied together below the knee and thus the risk of Daisy kicking the bucket, or putting her foot in it, is obviated. The Friesian—great framed, big-boned, well-fed animals—is the favoured breed. In Holland one never sees a poor cow. Most of the milk is used for cheese, which is processed in co-operative factories. The cheese is moulded, as a rule, into balls about as big as a boy's soccer football, then salted for a couple of days and then stored for curing. After a fortnight in storage they are marketed.

Living on the Cow.

Dutch farmers sell on outside markets something over 80,000 tons of cheese a year, valued at over £6,000,000 sterling. Butter exports are about the same. Condensed and powdered milk are also exported, their annual value approaching £5,000,000 sterling. Altogether in Holland, with its population of about 8,000,000 and its area of 12,500 square miles—about equal in size to a North Australian cattle station—nearly 600,000 people depend on the cow directly for a living. The dairy business is carried out co-operatively, almost entirely so, and the highest efficiency is aimed at in every stage of production, processing, and marketing. Every cheese, for instance, must bear the brand of the Netherland Cheese Control as a guarantee of quality. Every package of butter carries a similar guarantee.

Where Flower Gardens are an Economic Asset.

A short run by car from the dairying country brought us to a district where rural industry was entirely different. The land there was originally a lake bottom which had been entirely drained and reclaimed. Flower cultivation was evidently the main industry, and the whole way ran through beautiful flower gardens in which the tulip predominated. When these gardens are in bloom the delightful artistry of Nature reveals itself in a riot of gorgeous hues. The effect of this massed colouring is marvellous. In comparison one thought of emerald slopes in Picardy, poppy splashed—seemingly careless spills of intensest red on fields of green enamel; of apple lands in Normandy in early autumn; of an English woodland in summer with its beautiful bluebell carpet; of the Vale of Glendalough in Ireland, where the

greenest of green is seen; of Scottish highlands clad in royal purple when the bloom is on the heather; of streets in Perth when the flowering gums are blossoming; of cannas grouped in Sydney gardens; of Brisbane in jacaranda time, or later, when the poinciana offers for our admiration its glory of scarlet beauty. A large export trade in bulbs and seeds has been built up with Britain, America, and other countries. The flower lands have been cut up into very small holdings, and that is one of the reasons why farmed area averages are so low in Holland. About three-fourths of all the farms in the country are of areas less than 25 acres. About 15 per cent. are from 25 to 50 acres, and only 2 per cent. more than 125 acres in extent. Only twenty-four people in Holland own more than 500 acres, and only 216 holdings are more than 250 acres.

Every district seems to have its own distinctive rural industry. For instance, round about a place called Boskoop something like 10,000 people make a living out of cultivating nursery stock, mainly for export. From Boskoop it is only a coo-ee over to Gouda, where cheese is the standby; and not far across to North Brabant and the southern province of Limberg where cheese, though of a different order (and smell), is also made.

From the flat country Limberg is a break with its picturesque, low, road-ribboned hills and quadrangles of growing grain and blossoming orchard lands.

Reclamation of the sea bottom and other water-covered lands is still proceeding in Holland. The Zuyder Zee is the scene of the biggest operation, and it is planned to add, when this project is completed, 500,000 more acres of fertile soil to the Netherlands land area, which will make more room (not much) for Holland's ever-increasing population.

One of the World's Best Object Lessons.

There was always, in one's brief wanderings through parts of rural Europe, something to learn, estimate, or compare—the characteristics of the people, their customs, methods, traditions, outlook, and so forth. And there was always much to wonder at, to appreciate, and to highly appraise. There was to be experienced, too, the charm of scenic variety and historical associations in many lands where the records of our human story are etched on every contour, and in which many architectural monuments mark as milestones the march of human progress down the centuries.

One of the most interesting countries of Europe is Holland, or, as the Dutch like to call it, the Kingdom of the Netherlands, and it furnishes one of the best object-lessons in the world in the way of conversion of waste lands into fertile and prolific farming country. Holland, as we in Australia measure areas and distances, is a very small country with its total land surface of 12,500 square miles. The country is divided naturally into low-lying delta lands, which have been reclaimed from the sea—a region of natural channels and canals—and a definite section of that great North European plain which takes in Belgium and Northern Germany. The climate is rather colder than England, and, as cultivation of the soil is so intense, there is very little natural vegetation. Holland's main home production includes bulbs, sugar-beet, flax, other ordinary farm and garden crops, and dairy produce. It is net-worked with an excellent road system, and water carriage by canals adds to the ease of transportation. It does a large transit trade with the Rhine Valley, and also a big export business with Britain and its nearer neighbours.

Something Like an Agricultural Problem.

Nearly 35 per cent. of Holland's total area is alluvial, and that accounts for its great fertility. Originally much of the land along the North Sea coast, which is below sea-level, was peat moor constantly flooded. Lakes were formed, and these were drained or pumped dry by windmill power. The lake bottoms and other water-logged lands were converted by infinite labour against river and sea encroachment into very rich pasture lands. That was something like an agricultural problem.

This great national work, of course, could not be done by individuals, and a system of co-operation was instituted throughout large districts. This co-operative system of water fighting was not backed by any State organisation. Its beginning was the effort of private initiative a thousand years ago.

This spirit of co-operation, which is one of the outstanding characteristics of the Dutch farmer, in rural enterprise was, through continual battling against the elements, with the possibility of overwhelming disaster always round the corner, grafted into the very soul of the nation.

Modern engineering skill has, of course, removed what was an ever-present dread; it has been a great factor in the success of other and more extensive reclamation schemes in Holland, but the cost of maintenance of dykes and waterways still goes on. From 10s. to £1 an acre is the annual charge imposed for the upkeep of the service. The reclaimed lands are of great natural fertility, and not only is a high acreage production the rule, but crops are regular and reliable. As Britain may be regarded as the stud stock farm of Europe (and the world generally for that matter), so Holland may be called the vegetable garden of Western Europe.

The low level of the country and natural fertility of the soil, so much of which was won from the sea, is very favourable to dairying as practised in Holland. About 27 per cent. of the country is cultivated, and about 38 per cent. is under permanent pasture, but these figures do not give quite a clear idea of the importance of grass lands in Holland. Most of the best soil is carrying grass, and grazing of dairy cattle there may be described almost as an exact science. Not a square yard of pasture is allowed to remain idle, and pasture restoration and renovation are carefully and continually practised. In some districts not a single acre of ploughed land is to be seen, only 5 to 10-acre fields, as flat as a tennis lawn, in which a furrow is never turned, and on which one seldom sees a horse, but instead herds of sleek dairy cows cud-chewing or grazing contentedly, and occasionally some sheep and pigs.

Dutch Dairying.

In Holland, according to the information available, in the course of the last fifty years or so, cattle breeding, cultivation, and dairying have been so improved technically that, notwithstanding an ever increasing population and consumption, the export surplus of dairy products has kept going up. Although the population has increased since 1900 from 5,000,000 to somewhere about 8,000,000, the export of butter has gone up from 22,000 to 45,000 tons; of cheese from 47,000 tons to 84,000 tons, and of condensed milk from nothing to 148,000 tons. The fact that Holland, with all its disadvantages and physical difficulties, is probably the greatest exporter of cheese, proves how much the production of food can be increased by sound farming assisted by trained scientists and technical experts.

Another remarkable thing is that this high production is possible in a country where most of the farms are comparatively small. Large landed estates are unknown in Holland. In the pastoral districts the size of the farms varies between 40 and 100 acres, cattle are kept in the open from mid-spring until late autumn, and housing of stock is thus necessary for about five months of the year.

That agricultural production in Holland has been lifted to such a high level is due not only to the practical skill of the Dutch farmer, but also, as in Denmark, to the excellent organisation of agricultural instruction by the State. The way is made easy there for every farmer's son to receive sound technical farm training, and for the farmers to obtain sound advice at very little cost. In this regard our own system in Queensland bears favourable comparison, with this difference—that the services of trained agriculturists and scientists are made available to the Queensland farmer without any charge whatever.

Rural Education.

Of course, in Holland with its long winters, when farmers naturally spend much of their time indoors, rural education is sought, perhaps, with greater earnestness, but so strong is public opinion there on this subject that a young farmer who has not attended an agricultural winter school, or, at least, taken a winter course in agriculture or animal husbandry, is not taken seriously. The consequence is that the younger generation of farmers no longer holds on to old-fashioned ideas and working methods, but eagerly applies in practice every available modern improvement. In Queensland we are doing something in this way through an excellent system, which is developing well, of winter schools of instruction for farmers at the Queensland Agricultural High School and College at Gatton.

No Fancy Farms in Holland.

Another fact worthy of consideration is that, in a country of small farmers, not overburdened with capital, breeds of dairy cattle should be worked up to such a high standard. In other countries this work is left to a few expert breeders. There are no fancy farms in Holland. Dutch breeders have always been influenced by economic conditions, and a Dutch farmer, we are told, cannot indulge in the luxury of breeding fancy cattle. Experience has taught him that raising milk

production abnormally would, in the long run, give a smaller financial result if, at the same time, attention were not given to the cow's constitution. Nor does the Dutch farmer set any great value on artificially boosted high milk production of individual animals, especially when the fat percentage is not taken into account.

The Importance of Herd Testing.

He attaches great importance to milk-testing; more than 65 per cent. of the milch cows in Friesland, for instance, are regularly tested. Not only the milk production, but the fat percentage is regularly determined, and in selecting breeding cattle, greater importance is attached to the latter than to the former. By applying this method the average production of milch cows inscribed in the Friesian Herd Book has been raised from 4.357 kilos (kilog equals 2⅕ lb.) in 1912 to 4.586 kilos in 1924, and the fat percentage from 3.20 to 3.52 per cent., and the production of butter from 150 to 175 kilos within the same period.

In Queensland, of course, we have our own herd-testing scheme, the advantages of which are appreciated by an ever-growing number of dairy farmers. In other directions, too, we are well in the van of agricultural progress, but there are still left some avenues of rural enterprise in which, if I may so suggest, the Dutch farmer may be regarded by us all as a sound and industrious exemplar.

NOTES ON PROCEEDINGS OF THE AGRICULTURAL SECTION OF THE CONFERENCE OF EMPIRE METEOROLOGISTS, 1929.

Subjoined is a report of the proceedings of the recent Conference of Empire Meteorologists prepared by Mr. A. S. Fitzpatrick, M.Sc., who is attached to the staff of the representative in Great Britain of the Council and of the Development and Migration Commission, and which we have received from the Council of Scientific and Industrial Research:—

I attended the meetings of the above section of the conference held from 29th August to 4th September, 1929. During this time most of the overseas delegates attended, and there was a fair representation of agricultural research workers from Great Britain.

As will be seen from the attached papers, the subjects dealt with mainly concerned the ralationship between meteorology and various phases of agricultural research—viz., plant physiology and disease; fruit production; animal numbers; entomology; and crop forecasting.

Although papers dealing with one or more of these subjects were presented from most parts of the Empire, there was no printed contribution from Australia. Colonel Gold, however, read a paper which had been submitted by Mr. Hunt, the Commonwealth Meteorologist, dealing with the subject of seasonal forecasting. Despite the existence of valuable work—such as Richardson's studies on plant respiration—delegates to the conference might reasonably have deduced that there is little valuable co-operation in Australia between agricultural research workers and meteorologists.

The sectional discussions opened with a paper by Sir Napier Shaw on the value of weekly records of meteorological factors. Following discussion on this point, it was agreed by the conference that the monthly summary attended to obscure phenomena to a greater extent than would weekly averages, and that the week should, therefore, be adopted as a unit for observations in agricultural meteorology.

On the broader question of education in meteorology and its agricultural relationships, the conference felt that greater attention should be devoted by Universities, Agricultural Colleges, and Farm Schools throughout the Empire to provision of instruction in the physics of the atmosphere and the geography of weather.

It was obvious throughout the meetings of the section that the meteorologists were not fully aware of the exact data required by the research worker, and that the research worker, when he knew the exact data he required, was not aware of the apparatus or methods suitable for arriving at this data. This gave rise to one motion that meteorology could render valuable service to agriculture by assisting agriculturalists to devise standard methods for adoption in the systematic recording of these local climates and by studying the results as meteorological data.

The section also considered that there was scope to extend standard records in order to measure factors such as the intensity and quality of radiation and the moisture content of soil. When, however, the results of agricultural research are published, the section considers that those results should be accompanied by adequate meteorological observations since the results may be susceptible to closer analysis in the light of the meteorological conditions experienced during the course of the research work.

The question of establishing a clearing station for information on methods and results of agricultural meteorological work was considered. The Ministry of Agriculture and Fisheries is at present doing work in this direction, and certain aspects of agricultural meteorology are covered by the existing Imperial Bureaux of soil, science, animal nutrition, animal health, animal genetics, entomology, and mycology. It was, therefore, felt desirable to ask the Ministry of Agriculture and Fisheries to develop its work in this direction with a view to obtaining information likely to be useful as a guide to the Imperial Agricultural Research Conference which is to be held in Australia in 1932. The papers definitely setting out to establish a relationship between meteorological factors and specific problems in agricultural research in most cases showed that though their authors felt that meteorological factors were important and in some cases predominant in their influences, the exact degree of influence exerted by those factors had not been determined. For this reason motions were proposed and carried recommending surveys in different parts of the Empire to determine, for example, for fruit crops the effect of varying weather conditions on the growth, cropping, and resistance to diseases and pests of fruit grown on soils of various types, and the degree of susceptibility to frost damage of the chief commercial varieties of fruit, and to discover the characters which confer resistance to frost.

In regard to the numbers of wild animals, it was felt that the fluctuations in these numbers was closely related to meteorological conditions, and that co-operative research should, therefore, be prosecuted.

Again, in relation to insect pests and plant diseases and their mass outbreaks, it was considered that more attention should be paid to the effects of atmospheric phenomena.

The question of forecasting crop yields provoked considerable discussion, and it was obvious that there was a wide divergence as to the best methods of estimating yields.

The section finally agreed that complete investigation was necessary to determine reliable methods for the improvement of forecasts. The statistical methods of Dr. R. A. Fisher, of Rothamsted, in ascertaining the effect of rainfall on wheat yield were mentioned in this connection, and it seems likely that Dr. Fisher's methods will be thoroughly examined during the next two years.

One's general impression was that the sectional discussions had provided a useful opportunity for the agricultural research workers to place before meteorologists of the Empire some of their difficulties, and the need for a closer connection between the study of weather and climate and the examination of biological problems. In particular, useful discussions took place on the best methods of recording soil temperatures, and of determining the photo-electric and photo-chemical intensity of daylight.

THE MOTOR A MODERN BLESSING.

"To state quite bluntly that the whole face of the civilised globe has altered and is being altered by motor-cars, to an extent which changes the attitude of the public towards morals, comfort, health, and even facial characteristics, savours of exaggeration at first sight," writes Professor A. M. Low, in the "Sunday Dispatch." "For a fortunate few the motor-car still possesses its sporting attraction, but to the majority it has become a necessity; far more important than the doctor's brougham and capable of bringing a new atmosphere into every phase of domestic or commercial life. The motor-car spells freedom. It is the most revolutionary agent that civilisation has known. It is helping to produce international peace and international language. It is changing the face of the world before our very eyes. An invention which brings with it a desire for education cannot but benefit mankind. Make no mistake. The changes that are taking place in civilisation are not all for the bad. For many of them the motor-car is entirely responsible."

CHICKEN-POX IN POULTRY.

From February to May is the period over which trouble from chicken-pox may be expected by poultry farmers in this State, but by the adoption of the proper measures much can be done to minimise loss.

Chicken-pox, or ''warts,'' is generally ascribed to bites of mosquitoes, which are believed by some to be the sole cause of the malady, but this is incorrect, observes the Poultry Expert of the Department of Agriculture. The so-called ''warts'' are proved, by both practical experience and scientific investigation, to be ''chicken-pox,'' a specific disease, just as are small-pox and chicken-pox in human beings. Experience has shown that it is preventable in poultry—mosquitoes notwithstanding—at any rate so far as any ill effects are concerned.

It is admitted that mosquitoes play their part in its dissemination once it prevails among an unprotected flock, but the only question that is still in some doubt is whether the mosquitoes actually carry the infection, or whether the punctures made by the mosquitoes allow an opening for the infection to reach the blood, and more readily induce the infection. Observations suggests that the mosquito is not necessary to an outbreak of the disease, inasmuch as outbreaks occur where mosquitoes are not present. In these cases the first signs of the disease are yellowish-looking blebs, varying in size from a pin's head to a split pea about the combs and wattles of the birds. It is certain also that a place can be swarming with mosquitoes without any appearance of the disease, even in the season for it. Therefore, the mosquito, as a cause, must be acquitted. That it is a blood disease is definitely known.

Treatment.

Upon the first signs of the outbreak of this disease, the administration of Epsom salts and sulphur, as recommended below, should be at once begun, but in rather larger doses, or more frequently for about three weeks. The disease will run its course once it has broken out; but its severity may be modified in the case of the birds that take it later.

As soon as the sores appear, the main thing is to dry them up. For this purpose there is nothing better than painting the sores with tincture of iodine. Common laundry blue is also useful for drying them up. The iodine should, however, not be used on sores on the eye; this is where the blue is most useful. The painting will allay the itching irritation which causes the fowl to scratch the sores, and thus spread them all over the face, head, and comb. The sores spreading around the eyes and beak are responsible for most of the losses, owing to their preventing the birds from feeding; starvation, not the disease itself, causes most of the deaths.

The loss occasioned by an outbreak of chicken-pox is not only the actual loss by death, however, but the ruin of all prospects of winter eggs from the pullets attacked, because, after having had this disease, they usually break up and go into a half moult.

Measures for Prevention.

The measures that may be adopted to this end are very simple, but they must be commenced at the right time, and they must be faithfully carried out. To be effective, a commencement should be made about the first week in January, and 1 oz. of flowers of sulphur for the equivalent of every fifty adult birds should be given in the morning mash every third day for a period of three weeks. This should then be stopped, and for the next three weeks Epsom salts should be added every third day to the drinking water at the rate of 1 oz. to the gallon. At the end of the three weeks stop the Epsom salts and return to the flowers of sulphur in the mash, and continue alternating these treatments until the period over which chicken-pox is seasonable is past.

It is emphasised that the full protective benefit of the flowers of sulphur will not be obtained unless the advice given is carried out in its entirety and to the letter, but in order that no misunderstanding may arise it may be stated in terms of weight for weight. To every 7 or 8 lb. of the mash, whether wet or dry, 1 oz. of sulphur should be mixed, commencing well ahead of the time when the disease is liable to appear, and continuing till the season is over, which means that it is advisable to commence the sulphur treatment now, and to continue it through the summer till about April, or even May.—A. and P. Notes, N.S.W. Dept. Agric.

THE DAIRY HEIFER.

The dairy heifer is a unit of the potential milking herd. The breeder who knows how to grow and handle dairy heifers will add substantially to his achievement with his dairy herd.

The demand for reproduction and milk production are so heavy on high-producing dairy females that every opportunity must be given for growth and development before the animal begins her lactation period.

Improper feeding and breeding at too early an age are two factors to avoid.

The time to take advantage of the growth impulse is when it is most potent and when demands for milk production do not interfere with its influence.

Do not allow the dairy heifer to get a setback by turning on to scant pasturage or by improper feeding.—C. F. McGRATH, Supervisor of Dairying.

CHOOSING A DAIRY BREED.

The question of what breed of dairy cattle is the best had been asked by a number of persons either about to enter or engaged in the dairy business.

It is not so much the question of breed that requires consideration as the question of profitable producers.

There are good dairy animals that are profitable at the pail in all dairy breeds, and it is true also that poor producers are found in each breed. The selection of animals within the breed chosen is the matter of most importance. The breed chosen should be the one that appeals to personal taste and that is suitable to the conditions under which they are to be dairied. Any one of the dairy breeds is worthy of a place on our dairy farms.

The sure way to determine the dairy animal's value is to test it for production. The progeny of animals whose production has been recorded should be secured when possible. The milk-producing trait is hereditary, and selected females should be bred to sires with production on paternal and maternal sides.—C. F. McGRATH, Supervisor of Dairying.

DAIRY HERD IMPROVEMENT.

By C. F. McGRATH, Supervisor of Dairying.

An important factor of success in dairy farming is the use of improved dairy sires. Good dairy cows are far too scarce, and it would be impossible for dairy farmers to purchase a sufficient number of them to replace all unprofitable cows at present in our dairy herds. The way to fill the places of the unprofitable cows is by selection of females and the use of improved dairy sires. To continue dairying unprofitable cows and rearing females from them increases the number of "scrub" dairy cows, and is inimical to the progress of the industry.

The dairy farmer who continues to breed heifers from unprofitable cows will not secure a return commensurate with the capital invested and labour employed. Every breed of improved live stock has been developed by well-defined laws of breeding and selection. Under the influence of skilful selection, breeding, and feeding, the dairy cow has made marked and rapid changes, both in type and functions, and differs greatly in general characteristics from the foundation stock from which the modern type of dairy cow has been evolved. The evolution of a special purpose dairy cow as we know her to-day is a tribute to the work of the breeders of dairy cattle.

The use of a pure bred dairy sire is essential, as purity of blood denotes that the animal possesses the characteristics of his breed for generations back. Pedigree alone, however, does not guarantee that a sire will beget heavy producing females.

Selection of a Dairy Sire.

The chief consideration in selecting a sire to head a dairy herd is the production records of the dams on both the maternal and sire sides.

The dairy sire either increases or decreases the production of his progeny. A prepotent dairy bull bred on production lines will beget offspring that are an improvement over their dams from the standpoint of production.

The solution of the problem of providing the necessary number of profitable dairy females to replace the unprofitable cows on our dairy farms depends upon systematic testing, culling, and the use of improved dairy sires.

The production recording of the cows comprising our stud herds is receiving increasing attention, and the records of thirty-three pure bred cows that in September and October, 1929, completed a 273 days' test and qualified for entry into the respective herd books, which are listed as follows, are well worth perusal:—

Cows that completed 273 Days Test and Qualified for Entry into the Herd Book for the months of September October, 1929.

Owner.	Address.	Name of Cow.	Age at Commencement of Test.	Milk Yield.	Butter Fat Yield. Lb.
		Illawarra Milking Shorthorn.			
S. R. Alcock	Wooroolin	Favourite of Pine Park	Aged	9,345·25	388·037
J. Bradley	Goomeri	Wunulla Queenie 4th	Senior (2-year old)	6,701·148	286·724
J. Bradley	Goomeri	Wunulla Graceful 2nd	Junior (3-year old)	8,994·746	376·308
H. Dickfos	Coleyville	Molly 2nd of the Cedars	Senior (4-year old)	10,288·0	386·54
G. Heading	Murgon	Red Rose of Headlands	*Junior (2-year old)	11,407·298	430·72
G. Heading	Murgon	Miss Amy of Headlands	Senior (3-year old)	8,545·973	346·617
S. J. Lester	Laidley	Tottie 9th of Brooklyn Terrace	Junior (2-year old)	6,834·59	269·823
G. Lindenmayer	Binjour	Florrie of Wandegong	Senior (2-year old)	7,554·25	305·728
S. Mitchell	Warwick	Fuschia 3rd of Rosenthal	Aged	10,571·5	415·291
S. Mitchell	Warwick	Lilac of Goomburra	Aged	10,581·5	437·598
J. Phillips	Wondai	Midge 6th of Greyleigh	Aged	11,057·0	452·906
Queensland A.H.S. and College	Gatton	Rascal 12th of Thornleigh	Junior (2-year old)	6,048·125	247·839
Queensland A.H.S. and College	Gatton	Pet 6th of Thornleigh	Junior (2-year old)	6,786·825	272·567
Queensland A.H.S. and College	Gatton	College Violet	Junior (2-year old)	5,617·525	231·285
Queensland A.H.S. and College	Gatton	Queenie 5th of Fairholme	Senior (2-year old)	8,231·875	331·012
F. W. Woolley	Moregatta	Lovely 2nd of Beechwood	Senior (2-year old)	6,471·3	275·734
F. W. Woolley	Moregatta	Marigold 2nd of Beechwood	Senior (2-year old)	7,003·8	265·454
		Jersey.			
R. A. Anderson	Yandina	Yimmin Shooting Star	Junior (2-year old)	4,295·9	241·966
R. A. Anderson	Yandina	Yimmin Society Girl	Junior (2-year old)	3,958·15	214·151
A. F. Birt	Gundiah	Buttercup of Glenore	Junior (3-year old)	5,537·25	307·653
J. Collins	Tingoora	Lady of Calton	Aged	10,389·25	597·151
J. Collins	Tingoora	Maisie of Calton	Senior (3-year old)	7,412·125	378·49
J. Collins	Tingoora	Lady Dorothy of Calton	Aged	9,176·0	559·333
J. Collins	Tingoora	Cynthia of Calton	Junior (2-year old)	6,947·0	371·78
J. Collins	Tingoora	Maud of Calton	Senior (4-year old)	8,264·25	450·417
B. J. Jensen	Rosevale	Hazel of Woodstock	Senior (2-year old)	4,912·125	281·797
B. J. Jensen	Rosevale	Ena of Woodstock	Senior (2-year old)	5,674·625	304·663
B. J. Jensen	Rosevale	Managers Zebuda of Woodstock	Senior (2-year old)	4,856·5	216·278
Chas. Klaus	Mundubbera	Lily of Golden Hill	Junior (2-year old)	4,279·5	247·774
McGeehan Bros.	Kairi	Werribee Sweet Larkspur	Junior (3-year old)	7,414·55	352·413
McGeehan Bros.	Kairi	Inasfayl Bonney	Aged	9,222·35	478·269
T. A. Petherick	Locyker	Trecarne Carnation	Aged	6,444·825	381·356
T. Richters	Tingoora	Beauty 4th of Oaklands	Junior (2-year old)	7,171·625	278·595

* 365 Days.

CLIMATOLOGICAL TABLE—DECEMBER, 1929.

SUPPLIED BY THE COMMONWEALTH OF AUSTRALIA, METEOROLOGICAL BUREAU, BRISBANE.

Districts and Stations.	Atmospheric Pressure. Mean at 9 a.m.	Shade Temperature. Means. Max.	Means. Min.	Extremes. Max.	Date.	Min.	Date.	Rainfall. Total.	Wet Days.
	In.	Deg.	Deg.	Deg.		Deg.		Points.	
Coastal.									
Cooktown	29·83	91	78	102	16	74	2, 19, 20	157	5
Herberton	..	85	63	92	17, 22	58	8, 16	196	7
Rockhampton	29·85	93	71	102	22	63	4, 6	240	5
Brisbane	29·87	87	68	97	15	60	6	190	7
Darling Downs.									
Dalby	29·84	91	62	101	21	51	6, 17	428	7
Stanthorpe	..	84	54	97	10	39	7, 17	336	9
Toowoomba	..	86	59	98	10	47	5	332	8
Mid-interior.									
Georgetown	29·80	97	71	104	22	62	18	263	6
Longreach	29·78	100	72	110	22	58	4, 5	57	6
Mitchell	29·83	92	62	102	9, 24	49	6	253	7
Western.									
Burketown	29·80	95	76	102	17,18,19	72	30	316	5
Boulia	29·78	99	70	113	23	60	4, 5	30	4
Thargomindah	29·80	93	70	112	24	58	4, 5	9	1

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF DECEMBER IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALL DURING 1929, AND 1928, FOR COMPARISON.

Divisions and Stations.	Average Rainfall. Dec.	No. of Years' Records.	Total Rainfall. Dec., 1929.	Dec., 1928.
North Coast.	In.		In.	In.
Atherton	7·72	28	3·43	6·50
Cairns	8·69	47	5·99	3·75
Cardwell	8·27	57	1·66	3·83
Cooktown	6·87	53	1·64	3·07
Herberton	5·72	42	1·96	6·58
Ingham	6·99	37	1·13	8·78
Innisfail	11·84	48	0·76	10·34
Mossman	11·49	16	5·42	4·29
Townsville	5·58	58	2·19	3·76
Central Coast.				
Ayr	3·97	42	1·53	4·13
Bowen	4·46	58	2·99	2·10
Charters Towers ..	3·55	47	2·12	3·82
Mackay	7·40	58	3·30	10·10
Proserpine	8·38	26	1·05	10·10
St. Lawrence.. ..	4·78	58	1·04	7·80
South Coast.				
Biggenden	4·73	30	1·92	2·81
Bundaberg	4·96	46	6·24	1·19
Brisbane	4·90	78	1·90	2·56
Caboolture	5·24	42	4·23	3·88
Childers	5·78	34	1·84	4·29
Crohamhurst ..	7·12	36	8·91	4·24
Esk	4·70	42	4·18	9·64
Gayndah	4·17	58	2·01	3·28
Gympie	6·10	59	3·13	4·01
Kilkivan	4·59	50	3·27	2·71
Maryborough ..	4·77	57	2·45	5·10

Divisions and Stations.	Average Rainfall. Dec.	No. of Years' Records.	Total Rainfall. Dec., 1929.	Dec., 1928.
South Coast—continued:	In.		In.	In.
Nambour	6·86	33	8·05	5·04
Nanango	3·87	47	4·03	4·90
Rockhampton ..	4·81	42	2·40	4·36
Woodford	5·69	42	6·69	2·79
Darling Downs.				
Dalby	3·22	59	4·50	3·09
Emu Vale	3·60	33	1·64	5·24
Jimbour	3·23	41	4·66	4·28
Miles	2·96	44	5·89	2·28
Stanthorpe	3·54	56	3·36	4·94
Toowoomba	4·37	57	3·32	5·91
Warwick	3·44	64	2·74	2·74
Maranoa.				
Roma	2·49	55	2·39	1·53
State Farms, &c.				
Bungeworgorai ..	3·08	15	1·74	..
Gatton College ..	3·64	30	2·39	3·52
Gindie	3·03	30	2·36	2·58
Hermitage	3·05	23	2·22	..
Kairi	6·69	15	1·39	3·29
Mackay Sugar Experiment Station ..	8·92	32	2·73	8·65
Warren	3·84	14	..	1·18

GEORGE G. BOND, Divisional Meteorologist

TWO STRAWBERRY LEAF DISEASES.

By J. H. SIMMONDS, M.Sc., Plant Pathologist.

Leaf scorch and eye spot are the two most common diseases of the strawberry occurring in Queensland. Both are foliage diseases which are capable of causing severe damage to susceptible varieties during a wet season. As in this State the varieties susceptible to the one malady are usually resistant to the other, it is difficult to form an estimate of their relative importance, this being determined by the extent to which any one variety is grown in a district. Scorch is probably most severe in its effect on the plant. Both these diseases are found widely distributed throughout the New and the Old Worlds where they have been known for many years.

Leaf Scorch.

The disease known as leaf scorch shows up first as small purple spots on the outer older leaves of the plant. These gradually enlarge until they are $\frac{1}{8}$ to $\frac{1}{4}$ inch in diameter, remaining either a uniform dark purple or drying out in the central region to a dark brown. The centre never exhibits the light colour characteristic of eye spot. As the spots become older the leaf tissue immediately surrounding them becomes discoloured and dies, and, if they are at all numerous, as is the case when the disease has reached serious proportions, these areas will coalesce so that eventually a large area of the leaf turns brown and dries out. It is to the appearance of the brown and somewhat shrivelled areas commonly found working in from the margin that the disease owes its name of scorch. The leaves are affected in order of their age so that it is common to find plants badly attacked by the disease with their outer leaves brown and shrivelled, and those within showing a more distinct spotting which gradually becomes less until the younger leaves may be quite free.

Purple brown blotches may also be found on the stalks of the leaves and fruit. When these are attacked girdling may result in the loss of flowers and young fruit. In some cases clusters of minute black pustules may be made out on the upper and lower surfaces of an old spot. These represent the fruiting bodies of the fungus causing the disease.

It is sometimes difficult to distinguish scorch in its late stages from red spider injury. The latter commences as a light reddish-brown discolouration of certain relatively broad areas of leaf. These areas are usually indefinite and diffuse, and not in the nature of clearly defined spots. When these areas dry out they closely resemble the older stages of leaf scorch, but even then may be distinguished by the fact that on the under surface may be seen the remains of the delicate webbing formed by the red spiders—this usually being made more apparent by the collection of cast skins, soil debris, &c., held in its threads.

Cause.

The disease is caused by a fungus parasite known scientifically as *Diplocarpon earliana*. This fungus is distributed about a field by means of spores, which are minute bodies corresponding in function to the seeds of flowering plants. Should one of these spores be splashed or carried by air-currents so as to alight on a strawberry leaf, it is able,

Plate 39.—Above: Strawberry leaves exhibiting symptoms of leaf scorch. Below: Section through a leaf lesion showing conidial fruiting pustules of *Diplocarpon earliana.* (Highly magnified.)

Plate 40.—Above: Strawberry leaves affected with eye spot. Below: Section through a leaf spot showing conidial fruiting bodies of *Mycosphaerella fragariae*. (Highly magnified.)

when moisture conditions are suitable, to germinate and penetrate the leaf-tissue by means of a delicate thread. This then forms numerous branches which gradually kill the leaf-tissue in their vicinity until finally a clearly visible and characteristic spot is formed.

In order to reproduce itself and further spread the disease the fungus after a time commences to form a batch of spores. In the present case two kinds of spore may be produced, of which the more common is that illustrated in Plate 39. In the process of spore formation the fungus threads accumulate at certain points beneath the surface, and from this bed short upright branches are given off which develop from their apex small, broadly sickle-shaped spores. This process ruptures the upper layers of the leaf and exposes the spores to the air, ready to be carried away to infect further plants.

Contributing Conditions and Susceptible Varieties.

Like most fungus diseases moist conditions, whether brought about by low, damp situations or excessive rainfall, are conducive to the development of this disease. In the 1928 season, when there was an exceptional amount of rain during the autumn and early winter months, scorch assumed epidemic proportions in some localities.

Of the two varieties most commonly grown in Queensland the "Aurie" is highly susceptible to scorch, while "Phenomenal" is resistant. "Usher's Special" resembles "Phenomenal" in being resistant. When considering the susceptibility of these varieties to eye spot the position will be found to be completely reversed.

Eye Spot.

The early stages of eye spot closely resemble those of scorch in that there appears one or more small purple dots on the surface of the leaf. These enlarge somewhat and soon commence to dry out in the centre to a light brown. This region after further drying turns a light grey to almost white colour. The mature spot then appears as a distinct rounded or somewhat angular white spot one-sixteenth to one-eighth inch in diameter surrounded by a narrow and rather diffuse purple border. As with scorch it is the older outside leaves on which spotting is most abundant. When the spots are fairly numerous the adjacent tissue turns yellow and eventually dries out. There is thus produced finally a dry, shrivelled condition of the leaves resembling that formed in the case of leaf scorch but clearly distinguished from the latter by the presence of the definite white spotting which is discernible even after the leaf has completely dried out.

Cause.

Eye spot is another fungus disease caused in this case by the organism known as *Mycosphaerella fragariae*. This fungus is spread about the field by means of spores in much the same manner as in the case of leaf scorch. To the naked eye the fruiting bodies appear as minute specks scattered over the older spots. Under the microscope each of these is seen to consist of a number of short threads projecting in a cluster from the surface of the leaf, from the ends of each of which may be formed a narrow elongate spore (Plate 40).

Towards the end of the season another type of spore may be produced. These are contained in small rounded receptacles, and may serve as one means by which the fungus lives over until the next season. The fungus can also exist for several months in the purely vegetative state in connection with the spots in old leaves and then, later, form spores which will infect a new season's growth.

Contributory Conditions and Varietal Susceptibility.

The same climatic conditions favouring scorch are also suitable for the development of eye spot. That is to say, excessive rain during the growing season will probably result in a serious outbreak with much defoliation and consequent reduction in crop.

Of the common Queensland varieties those susceptible to leaf scorch are resistant to eye spot, and vice versa. Thus, "Phenomenal" and "Usher's Special" are susceptible to eye spot, while "Aurie" is resistant.

Control of Scorch and Eye Spot.

(1) The fungi causing both scorch and eye spot live over from one season to the next associated with old leaf debris left in the soil or on the plants. Hence the method often adopted of renewing the plants each year, especially if fresh land and clean plants are selected, should greatly aid in keeping the disease under control. Old plants should be removed and burnt as soon as finished with in order to free the land from infectious material.

(2) If it is not intended to renew the plants all diseased foliage should be removed and burnt at the end of the season. Another plan is to mow the plants after the crop has been taken off, and after covering the dead leaves and plants lightly with dry grass run a quick fire over them.

(3) When planting, runners should be obtained from a locality from which leaf disease is absent, or at least from a plot in which this is not present to any extent.

If some of the runners are found to be affected the diseased leaves should be removed. Any plants badly attacked should be discarded entirely.

If it is not possible to obtain runners from a disease-free field, the mowing and burning mentioned above, followed by a Bordeaux spray as soon as the plants are commencing to shoot, will greatly aid in the production of clean runners.

(4) Avoid damp situations for strawberry planting.

(5) Other considerations being equal, use only varieties resistant to the disease most troublesome in the district concerned.

(6) Both leaf diseases can be controlled by spraying with a fungicide. Bordeaux mixture of 4.4.40 strength should be applied as soon as the new season's growth is well started. This should be followed by two or three further applications in order to ensure the leaves being kept well covered. These may be given up to the time that the first berries commence to form.

Spraying should not be expected to give satisfactory control unless attention is also given to the cultural practices mentioned above.

THE RECORD OF PERFORMANCE PLAN FOR SELECTING BREEDING STOCK.

E. J. SHELTON, H.D.A., Senior Instructor in Pig Raising.

In several of the principal pig-breeding States of America, in Canada, in Denmark, in Great Britain, Germany, and other countries, "Record of Performance Tests" to determine the production ability of breeding sows are now being carried out on systematic lines and largely under departmental control. The centres where these tests are carried out are usually referred to as "Testing Stations," and to their activities much publicity has been given in recent years. In this article Mr. Shelton discusses these tests and recommends that a similar system be introduced into Australia in the endeavour to still further build up and stabilise our pig industry.—ED.

Record of Performance Tests.

ARISING out of correspondence with several prominent American authorities on swine production, and per medium of the Agricultural Press specialising in this line of industry, a good deal of information is now to hand having special reference to the Record of Performance Tests, a system of testing breeding stock (pigs) with the same objective in view as that arrived at in the testing of dairy cows—i.e., to ascertain their productive capacity and determine whether they are worth retaining in the herd or not. The system of brood sow testing is necessarily different from that obtaining in the case of dairy cows, for, in the former, the records of performance have reference to the capacity for production, the rate of increase in weight and the suitability of the type of stock produced for market requirements, whereas, in the case of dairy cattle, the principal objective is to ascertain the butter-fat content of milk and cream per the Babcock test, now universally in use in every dairying community.

Early Attempts.

Discussing the historical aspect of these tests, Professor E. F. Ferrin, and his associates P. A. Anderson and Don Johnson, of the Division of Animal Husbandry at the University of Minnesota, state that for several centures pigs have been selected and bred with the aim of producing stock which is economical in the use of feeds, and which yields carcasses of pork well suited to the demands of the consumer. Pig production in the United States on an extensive scale has been carried on for just about 100 years. During this time there have been many changes in type. These changes have come in the most part as a response to economic conditions, but there have always been other factors, some of them of little practical value, which have had considerable weight in the development of new types. It is just as true now as it was a century ago that the only reason for raising pigs is the production of pork in the most efficient way. But in reviewing the changes in type during the past century it is apparent that many times pig producers have been chasing rainbows rather than following strictly the most economical method of growing their stock.

The Position as it is in America.

Concerning the present-day type of pig, it is probable that producers are somewhere near the mark of greatest efficiency. However, it is not possible to say exactly in what points to-day's type of pig is most lacking in efficiency. There are many factors to be taken into account. The producer wants a pig which will make weight at a low cost. Brood sows must be prolific and good mothers, caring for their pigs carefully and nursing them well. No subsequent favourable influences can overcome the handicap of small litters at weaning time. The pigs must be hardy, resistent to parasites and disease, good feeders, consequently rapid in gains, and mature at an early age if they are to be money-makers. Above all, the pigs when fattened must yield carcasses which will comply closely with market demands. The demands of the pork consuming public must be satisfied if farmers are to make a profit from pigs.

It is a very difficult matter to gauge accurately the exact importance which each one of these many factors should have in forming the ideal type of pork or bacon pig. If pig producers are not now on the right road to the best type, the reason is the lack of accurate standards by which to measure the most profitable

type. We have been selecting and breeding pigs very largely according to the appearances of the animal. Within fairly broad limits the kind of pig which can be produced at a low cost and which satisfies market demands, approximately, is known. But the difficulty is that we have had no measures which have told us accurately whether the type in popular favour was the most efficient or not.

Standards Set Up.

There is a standard which can guide pig production to the right type. Dairy cattle breeders have made wonderful progress in breeding for type and efficiency in production. The same success is possible in pig raising if accurate standards of measurement are adopted. Denmark for a period of approximately eighteen years has followed a plan of breeding pigs on the basis of low cost of growing pigs and high carcass value. A great improvement has been made in the profit derived from raising these pigs. The essential points of the system apply to pig raising in the United States just as the testing of dairy cattle here was based largely on the methods followed in Scandinavian countries.

The National Swine Growers' Association of America has endorsed the Record of Performance Plan which is being worked out by a committee of that organisation. This plan provides a standard for selecting pigs that are the most profitable pork makers. It comprises the feeding out of four pigs selected from a litter which is large enough to make profit on the pigs a possibility. The amount of feeds necessary to make a pound of pork during the growth and fattening of the pigs from weaning age to an average weight of 225 lb. each is determined. Two of the four pigs are slaughtered and the carcass value carefully determined. If the pigs of a litter make gains at a low cost, and produce carcasses of high value, the breeder of the litter should develop his herd by the maximum use of this strain of blood. At the Minnesota Experiment Station pigs are bought at weaning age from all breeders who desire to co-operate with the Experiment Station in the Record of Performance Work. In time a Register of Merit will be established in which are listed those boars and sows whose offspring have been tested and found to be profitable pork makers. Breeders who wish to improve their herds on the basis of this plan can select Register of Merit stock when buying boars or sows. Accordingly, the Record of Performance Plan provides the most economically sound basis for breeding pigs which has ever been proposed.

Recent Experiments in America.

Last year (1929) ten Minnesota breeders co-operated with the University by sending in to the Station pigs from eleven litters. The pigs were started on feed at the age of sixty-five days. Four of the first litters to arrive reached the final average weight of 225 lb. per pig, and two pigs from each litter were, up to time of writing in October, slaughtered. The pigs of each litter were fed as a group of four in a way similar to every other litter. Shelled corn was self-fed. A protein mixture of 50 parts of tankage (meat meal), 25 parts of linseed meal, and 25 parts of choice alfalfa meal (lucerne meal) was self-fed also. The mineral mixture which was self-fed was composed of 50 per cent. high calcium ground limestone, 27.97 per cent. bonemeal, 20 per cent. common salt, 2 per cent. iron oxide, .01 per cent. copper sulphate, and .02 per cent. potassium iodide.

There was found to be considerable variation in the average daily gain of the pigs from the different litters, in quantities and kinds of feed consumed, and, of course, in the feed cost per 100 lb. of gain. There was also a difference in dressing percentages and in the desirability of the cuts, apparent after slaughter.

Feeding.—The differences between lots were in the methods of feeding. Shelled corn was fed dry in all cases and the mineral mixture was self fed to each lot. Middlings (i.e., pollard), tankage, and buttermilk were mixed and fed as slop twice daily to Lot I. The same amounts of these feeds were fed twice a day to Lot II., but the tankage and middlings were in dry form. Lot III. was fed the same as Lot I. except that all feeds were given three times daily. All dry feeds were self fed to Lot IV., and the buttermilk was supplied in a trough. Lots I., II., and III., which were hand fed, were given as much feed as they would clean up quickly at each time of feeding.

Housing.—Movable houses furnished shelter for the pigs and water was supplied each lot by automatic fountains. There was no difference in the type of the pigs, comparing one group with another when the feeding began. The pigs in this experiment were pure-breds of good type. Lot IV. showed a tendency to fatten more rapidly than the hand-fed pigs of the first three lots. The hand-fed pigs at the close of the feeding period appeared more growthy, and most of the gilts (young sows) were in good shape to be carried on for breeding purposes. The self-feeding method can be used for developing breeding stock if corn is not fed in this way.

American Conclusions.

1. In this experiment the pigs fed slop made a little more rapid gains than those which were hand fed the same feeds in dry form. This resulted in a smaller total quantity of feeds for 100 lb. of gain.

2. Feeding twice daily was just as satisfactory a method as feeding three times daily.

3. The self-fed pigs made a little more economical use of their feeds than the hand-fed pigs.

4. When feeding pure-bred pigs, slop feeding is a desirable method. For market stock self-feeding is the best method if the pigs are on full feed.

Because a few records do not give an accurate picture of average conditions, the breed of the litters are not listed. Each breeder who co-operates with the Experiment Stations receives a report of the pigs which he sent in. This is a reliable basis upon which to judge the value of the particular strain of breeding.

The Record of Performance testing will be continued in 1930. Pigs from sixteen litters can be fed out at University farm. While some changes in details are probable as experience shows the right way to establish the work on a permanent basis, the essential features of the plan will be as they are at present. Record of Performance work has the possibility of working greater improvement in the pig business than any other plan which has been tried in the United States.

The Experiment Stations want breeders to co-operate by selling it four pigs from one litter at weaning time to be tested. The litter should be from a desirable line of breeding. The sire and dam of the litter should be kept so that if the pigs make good records the strain can be increased in numbers rapidly. Nominations of herds will be accepted at any time and as many pigs fed out as the equipment of the piggeries will accommodate.

These American Records of Performance tests are still in progress at the Minnesota and Wisconsin and Iowa Experiment Stations (U.S.A.), and are being extended as opportunity offers to other countries. It will be noted that to set the recording of pigs along these lines into motion, it is necessary for interested bodies to get together and make the necessary arrangements for the tests to be carried out at some recognised experiment station, agricultural college, and/or on selected farms. Breeders desirous of co-operating arrange to send four pigs from a litter, two sows and two barrows, to the Testing Station as soon after the weaning as is possible. These pigs are then fed out under identical conditions with all the others on test. If so arranged the pigs are donated to the Testing Station or they are paid for at market price at the time they are sent in, and the breeder if he so desires may buy back one of the sows for breeding purposes at the same price. At the end of the test the other three are killed, records compiled on the rapidity and economy of gains, and the carcass and dressing efficiency are then rated and duly entered up.

The tests are referred to as intensely practical and as providing a reliable medium through which breeders of pigs may secure infinitely more reliable data as to the value of the breed sows and of the blood lines (other than of their ability to produce show-ring winners) than is obtainable through any other system. It is predicted by Dr. John M. Evvard that these tests will become the "Babcock tests of the pork-producing industry." For the first five years of the tests in America comparative figures on the different breeds will not be made public—after that they will be. As the breed sows in these tests are rated so will the breeds they represent be, hence it is highly desirable that all stock used in the tests should be of the very best it is possible to obtain in the breeds, otherwise the results would be misleading and a distinct detriment to the breed.

Queensland Tests.

Breeding tests in Queensland are at present in full swing at the Queensland Agricultural High School and College piggery, but these tests are not altogether on the lines of records of performance, though they aim at securing valuable and reliable data on early maturity, economy of production, suitability for market requirements, and prolificacy, all very special and necessary features in the production of stock for any market. The pigs resultant from these experiments are bacon pigs, the scheme aiming at a general improvement in this particular class of stock. The matter is one well worthy of the attention of Stud Pig Breeders' Societies, of Pig Industry Committees and other bodies, and it is hoped these notes will pave the way for the initiation of tests in this part of the world, where pig raising is looming large in public favour and where the farmers as a whole are intensely interested.

Further particulars regarding the Record of Performance Tests, Testing Stations, &c., may be obtained by writing to the Department of Agriculture and Stock, Brisbane.

Plate 41 (Fig. 1).

Westbrook Ruby 3rd (8898) and her litter of twelve. A noted brood sow of the Berkshire breed, bred and owned by The Farm Home for Boys, Westbrook, Queensland, where a stud of high-class Berkshire pigs is maintained in full profit, and whence many productive and prominent prize-winning animals have been distributed. Sows of this description are profit-makers of the very best type.

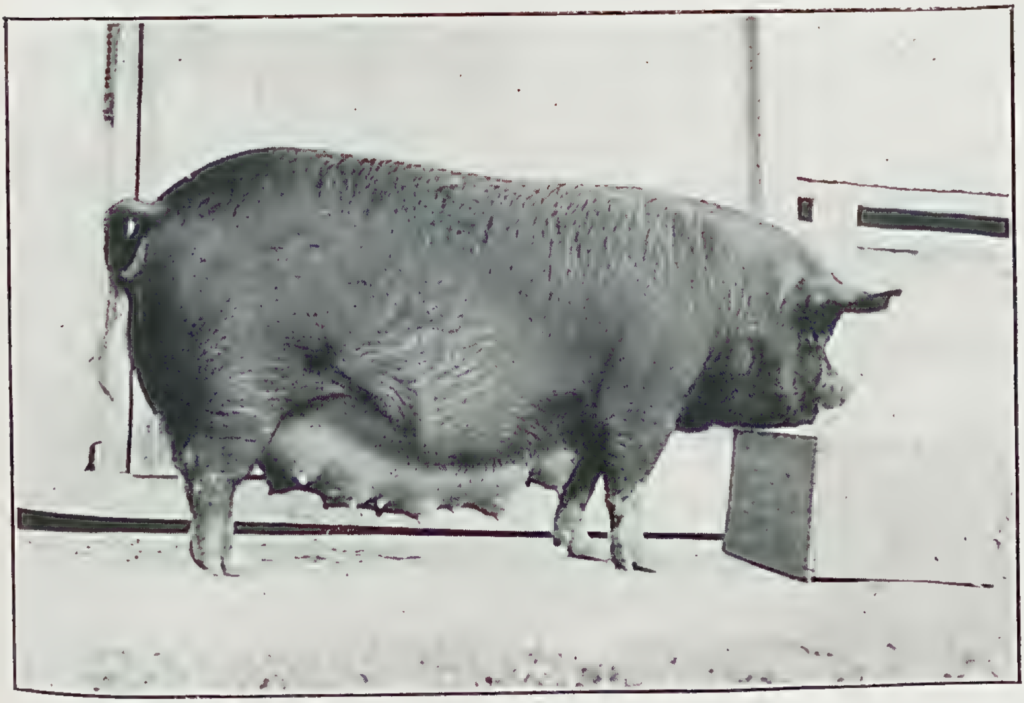

Plate 42 (Fig. 2).

Berkshire Sow, Gatton Pamela (8748), bred at the Gatton College and now owned by Mr. A. Drescher, of Pimpama, South Coast, Queensland. Note length and depth of body, development of teats and udder, and generally superior quality of this typical brood sow.

PLATE 43 (Fig. 3).—CHARTERHOUSE LADY (91), CHAMPION GLOUCESTER OLD SPOT SOW, MELBOURNE ROYAL AGRICULTURAL SHOW, SEPTEMBER, 1929.

Exhibited by Mr. A. E. Ball, a noted breeder of G.O.S. Pigs in the Southern State. Note pure quality, roomy body, shape of ears and colour markings.

Plate 44 (Fig. 4).—Champion Duroc-Jersey Sow at the Royal National Show, Brisbane, 1929.

This wonderful sow, Yamsion Flower (now unfortunately deceased) was bred by Mr. W. Koehler, of Yamsion, *via* Dalby, and was owned and exhibited by Mr. Alan F. Conochie, of Tingoora. Yamsion Flower set a very high standard among Duroc-Jersey Pigs in Queensland, and her type, quality and general excellence appealed to all. Her capacity as a breeder was clearly demonstrated by the production of a very fine sturdy litter of eleven Durocs a few days before her death. Her dam, Lawn Hill Flower, bred by Mr. Percy V. Campbell, and owned by Mr. Koehler is also a very fine animal.

THE QUEENSLAND PIG INDUSTRY IN 1929.

REVIEW OF A YEAR'S PROGRESS.

By E. J. SHELTON, Senior Instructor in Pig Raising.*

Statistics.

The Stock Returns for the year just ended are not yet available, but during the year we were advised by the Registrar-General's Department that at the 1st January, 1929, there were 215,764 pigs in Queensland, an increase of 23,817 head over the number recorded during the previous year. This number, 215,764 head, is above the general average of around 200,000, but it is not abnormal, nor could it be said it represents an unusual increase over the records of the past twenty or more years. It really represents a normal pig population, a safe number considering the uncertain nature of the seasons and the state of the pig markets generally.

In Queensland we have about one-fifth of the total number of pigs recorded in the Commonwealth, and on recent figures we have approximately 22 pigs per cent. of human population, which compares more than favorably with that of any other country in the world with the exception of Denmark, the United States of America, Canada, the Irish Free State, New Zealand, Germany, and South America, all of which have a much larger pig population per cent. of human population than is common in this country. In comparison with the Statistics of Human Population there are more pigs in the Northern State than in either New South Wales, Victoria, or the other States, though actually both New South Wales and Victoria carry more pigs than we do in normal years.

Present and Future Prospects.

It is apparent there is little or no prospect of any appreciable increase in the total number of pigs kept on farms while market conditions are unsettled and while the seasons are so variable, though it is safe to say there is no indication that the numbers are likely to suffer any serious decrease as a result either of unsettled markets or normally uncertain years. A long continued severe drought would certainly have a very serious effect, just as uncertain and unfavorable seasons check our progress and limit our production, nor are these conditions likely to alter so long as we are dependent entirely on local and interstate markets for our pork products. The normal increase in production can readily keep pace with increased demands, for, after all, we are not actually a pork-eating people; and, generally speaking, pork products, i.e. fresh pork, bacon, and hams and smallgoods are really looked upon more as luxuries than as actual necessities in Queensland homes, and until the producers and manufacturers of these products enter upon an extensive scheme to largely increase home consumption of these very appetising and nutritious articles of diet, we cannot expect any marked increase in the trade.

Knowledge of the Job—An Economic Phase.

In the pamphlet entitled "Pig Raising in Queensland," issued earlier in the year 1929, and still available for distribution gratis to those interested, various economic phases of the industry are dealt with, and stress is laid on the necessity of increasing our knowledge of the job before entering upon any extensive scheme for increased production. Therein it is stated that pig raising is one of the industries associated with dairying and mixed farming in which every farmer in Queensland is interested. As with other branches of agriculture the production of pigs is a business requiring specialised knowledge, though it may appear to the uninitiated there is nothing to be learned about feeding and handling pigs. Fortunately, the business is not one requiring a large capital or an expensive plant, particularly where it is associated (as it invariably is) with dairying and general farming. The provision of aboundant supplies of suitable foods, a liberal, and we may add, permanent water supply, clean comfortable accommodation, and necessary utensils are among the principal requirements, once the farmer is actually situate on a farm where it is possible to grow the necessary food and where conditions are favourable for the keeping of pigs and other stock. The specialist who intends devoting the whole of his time and a large capital to pig raising on commercial lines will, of course, work on different lines to the dairy farmer or to the suburban farmer who keeps a few pigs, or to the farmer engaged principally in the production of stud pigs.

* In a Radio Talk, broadcast from 4QG.

PLATE 45.—YOUNG PIG FARMERS IN THE MAKING.

The Senior Instructor in Pig Raising (Mr. E. J. Shelton) conducting a practical demonstration before a small group of Pig Club members at Mapleton, on the Blackall Range. The Head Teacher of the Mapleton State School (Mr. Radcliffe) is on the left of the group.

PLATE 46.

Mr. Shelton discusses matters of mutual interest with the Sullivan children, members of the Jinghi Gully Pig Club in the Jandowae district. Mrs. Sullivan, the mother of these sturdy Queenslanders, is President of the local branch of the Country Women's Association and, with Mr. Sullivan, is a prominent worker in all progressive schemes.

However, no matter what line the farmer may work on in carrying pigs among his farm stock, it is essential that careful consideration be given to the financial side of the proposition and especially at the outset, while all along continuous attention is necessary to factors that determine the profit and loss in the carrying out of the activities.

One certainly needs a sound knowledge of the job in order to make a success of it, while in addition one must really be keenly interested and have a love for the job if he is to stick at it and make it a commercial success.

Are Queensland Pig Raisers Efficient.

In reviewing the work of the year one may well ask the question: "Have we proved as efficient at our job as we should be, or are we lacking in any special direction?" Generally speaking I think it will be admitted that Queensland farmers are just as efficient at their jobs as are the farmers resident across the borders of the several States with whom we are bound up in this great Commonwealth, for our sheep and wool, beef cattle and dairying industries are quite up to the standards of the other States, while in sugar, fruit, and corn, cotton, wheat and other industries we have some of the best farmers in the Southern Hemisphere.

Nevertheless it must be admitted that, generally speaking, our pig raisers have yet a great deal to learn before they can be classed as efficient as they ought to be. The conditions under which pigs are kept on many farms and the general neglect in housing and accommodation bespeak a lack of knowledge or appreciation which is a hindrance to progress, and it is along these lines and in the use of better quality and more efficiently balanced rations that we need to specialise. I believe it will generally be admitted that the class of pigs kept on Queensland farms has improved to such an extent during recent years that we now compare more than favourably with our neighbours, though even in this direction there is room for improvement. We also need to pay more attention to marketing our pigs in a condition more suited to the requirements of the factories, for the industry still suffers a heavy burden of loss through the marketing of pigs in an overfat and overweight condition and from various other hindrances to the securing of the maximum price for every animal sold. We do not as yet make the fullest use of green stuff, of mineral matters, and even of drinking water, and in all these lines it is hoped we will record improvement during the coming year. We certainly need to be efficient for there are many pitfalls and stumbling-blocks to progress.

Teaching the Juniors.

It will be of interest to readers of this talk to know that there has been a marked increase in the number of boys and girls actively interested in the Pig Club movement, and to know that the year 1929 has been the best year we have yet experienced in this class of work. We have had close on 1,000 members specially interested in Pig Club work, plus a big army of children working in poultry and calf clubs and in other activities associated with the Home Project Scheme. These club members are taught to be efficient, and in almost every instance they have shown a remarkable aptitude and have indicated by their work that they thoroughly appreciate the necessity for giving strict attention to careful selection, breeding, feeding, accommodation, exhibition, and marketing of their stock. They are keenly interested, and we wish them all a very Happy and Prosperous New Year.

Schools of Instruction.

The Annual School of Instruction to Pig Farmers held at Gatton College (June, 1929) was a great success, and will be repeated again at the College in June, 1930, and we take this opportunity of making special mention of these Schools of Instruction, for they are of the utmost value and provide an excellent opportunity for those interested to get together for the mutual benefit of all concerned.

Visits to Factories.

We hope that in 1930 many other parties of farmers will make it convenient to visit the several bacon factories to see for themselves the conditions under which their pigs are handled and the various methods of manufacture and disposal. It is the right of every producer to study the methods of manufacture and to follow his products through the factories to their ultimate destination.

A BRITISH PIG RECORDING SCHEME.

Discussing the subject of Pig Recording as carried out by the Animal Nutrition Research Institute of the University of Cambridge, Department of Agriculture, England, in the first report (issued June, 1929) of the East Anglian Pig Recording Scheme, H. R. Davidson, M.A., Dip. Agric., and A. N. Duckham, M.A., Dip. Agric., have this to say as outlining the initial steps of these experiments;—

The Pig Recording Scheme.

Pig Recording is a subject which has recently come to the fore as a method of assisting and improving the pig industry in the same way that the measurement and recording of yields have proved invaluable to the dairying and poultry industries of this country. Our Scandinavian and other competitors for the English pork and bacon markets have for some years adopted the accurate recording of prolificacy, rate of maturity, feed consumption, and quality as an instrument of progress, which not only measures the efficiency of the sows, but also yields valuable data and figures on the status and efficiency of the whole pig industry in any one area. In Great Britain there exists a plethora of opinion on the various problems of pig keeping and on the relative value of the many breeds of pigs, and this initial report may be welcomed as one of the first attempts to substitute quantitative facts and measurements for such qualitative opinion. It is, therefore, opportune that it should appear at a time when so much attention is being focussed on pork and bacon production by the British Pig Industry Council, the Imperial Economic Committee, and other bodies.

Recording Methods.

After an interesting foreword by Professor T. B. Wood, the report deals with various methods of pig recording employed abroad, and points out that, although none of these methods can be considered suitable by itself for English conditions, the East Anglian scheme is partially based on foreign experience, but it is designed to obtain the essential data for the pig keeper with the minimum of trouble and expense. It is also shown that the value of any pig recording scheme lies not only in the information and facts it gives the farmer, but also in the way in which accumulated records can be used statistically to solve many of the pig keeper's problems, such as the most suitable herds or methods of management or the best age for castration. In addition, it helps to provide the much-needed liaison between the farmer and the research worker.

Results Obtained.

The second section of the report summarises the results obtained from the various herds. From these records it is estimated that the difference per bacon pig in the cost of production between the best and the worst herd was over £2 per pig in the eighteen months under review. The best herd marketed eight pigs from each litter and took seven months to make a bacon pig of 150 lb. dead weight, whilst the worst herd marketed only four pigs per litter, and required ten months on the average to reach the same weight. The average of all litters recorded was six pigs marketed per litter at 150 lb. dead weight in nine months. This illustrates the way in which pig recording can show the farmer his efficiency as a pig keeper, and it is interesting to note that in some of the less successful herds certain defects in feeding and management have been located, such as the feeding of unbalanced rations deficient in minerals and protein.

The scheme has not been in operation long enough yet to permit of the collection of information relating to the elimination of unprofitable sows and boars, but unsolicited opinions from farmer members, who must be the ultimate judges of the value of pig recording, indicate that they thoroughly appreciate its value, even in the relatively short time it has been running.

Other Information.

Subsequent sections present data on such questions as length of gestation, the intervals between farrowings, the relative weights at weaning of gilts and sows' litters, &c. Figures are put forward to show the paramount importance of weaning a large number of sound, healthy pigs per litter, and it is interesting to note the differences in the mortality before weaning and in the bacon quality of the two sexes.

With regard to quality, when ready for market many of the pigs were recorded at two East Anglian bacon factories, and it is shown that only two-fifths of the bacon pigs received were suitable for the better class trade. The chief faults were too thick back fat, heavy shoulders, and deficient length (in relation to weight), and the authors point out that these difficulties could partially be avoided if farmers were encouraged by the Wiltshire bacon curers to market their baconers at lower weights.

The report concludes with a section outlining the possibilities of the general adoption of pig recording in this country as a method of helping us, as pig producers, to fight and excel our continental and other competitors.

Copies of this report and of the second report (issued October, 1929) may be obtained on application to the Organiser, East Anglian Pig Recording Scheme, Department of Agriculture, University of Cambridge, England, at a price of 1s. 2d. each posted, or through the Senior Instructor in Pig Raising, Mr. E. J. Shelton, Department of Agriculture and Stock, Brisbane, to whom also inquiries may be addressed.

SCRUB TICKS IN SHEEP.

J. L. HODGE, Instructor in Sheep and Wool.

The Department had occasion during November to look for a cure for sheep attacked by scrub ticks. Messrs. Cobb Bros., of Windera Creek, near Murgon, reported the loss of about 250 sheep. Major A. H. Cory, M.R.C.V.S. (L.), Chief Inspector of Stock, has always advocated the use of trypan blue in the case of dogs, foals, or calves attacked by the pest, and authorised the writer to recommend its use in the case of sheep.

Trypan Blue as a Remedy.

This remedy was given to Messrs. Cobb. Bros., with excellent results:—

A 2 per cent. solution (about 9 grains to a fluid oz. of water) is made by dissolving the trypan blue in boiling water. A sediment falls as the solution cools, and this should be removed by filtering through a funnel in which a properly folded filter paper is placed, or a fine piece of clean linen which has been previously boiled. The solution is used. The hypodermic syringe and needle before being used should be placed in a dish containing water, then placed over the fire and boiled for ten minutes. This is now ready for use when the solution has cooled.

The injection can be made anywhere under the skin, and in the case of sheep I recommend under the arm where the skin is free from wool. A fold of skin is caught up with the fingers of the left hand and the needle manipulated with the right hand.

The dose for sheep is 1 to 5 tablespoonsful. A second dose may be given twelve hours after the first should it be deemed necessary.

Messrs. Cobb Bros. report the effectiveness of the remedy in three cases.

No. 1 was a sheep down for two days. This sheep had the first injection on a Thursday morning, and on the Friday following another dose was given. On the Sunday the ewe was noticed eating and drinking and going about on her hind legs and knees. Next day she was up and recovered.

No. 2 sheep could not walk a chain without falling. An injection was given, and two hours later the ewe walked away with the rest of the flock from the shed.

No. 3 was a ewe heavy in lamb lying alongside a dam. The injection was given in the afternoon, and next morning the ewe was up and feeding with the flock.

MERINO WOOLS IN QUEENSLAND.

By J. L. HODGE, Instructor in Sheep and Wool.

MUCH has been written within the past few years in the daily papers and the periodicals with regard to the loss in quality in Queensland wools during the last twenty years. In this connection it is interesting to note, and also important to every branch of the trade, that the main point in this discussion has been consistently missed by most of the writers expressing their opinions. This is probably accounted for by the fact that the writers referred to are, in nearly every case, associated with the wool in some shape or other after the product leaves the sheep's back. They are not the expressions of the breeders of sheep.

The point to which I have referred as having been missed is the constitution of the animal producing the wool.

The breeders of merino sheep in Queensland are, as a body, highly intelligent men, and experience has proved to them that to a certain minor extent only quality had to be sacrificed in the attempt, which has been highly successful, to evolve a profitable type of merino which was better fitted by nature to withstand the adverse seasons which have been in the past and which I am afraid will be more or less always with us.

Some thirty years ago it was common in the west of Queensland to find runs stocked with the "Saxony" type of merino. From this type 5 lb. was considered a good clip, and it was mainly from these sheep in Queensland and other parts of Australia also that this continent gained her pre-eminence as the fine wool merino country of the world.

Experience soon proved what a grave error the breeders of merino sheep in Australia were making, and with the further introduction into the field of breeding of the "Vermont" disaster would have been caused in a great many flocks if the mistake had not been recognised at a comparatively early date. To return to the "Saxony" type: This sheep, as has been stated, was considered as satisfactory when cutting, say, 4½ lb. to 5 lb. of wool. The fleece was of superfineness, spinning somewhere in the vicinity of 90 counts. The constitution, however, left everything to be desired, and the people of Australia generally owe thanks to those breeders of our merino flocks who recognised the menace to the national industry in time to rectify a mistaken policy which would have, if persisted in, ruined the industry for years.

To those constantly advocating "fineness" in our flocks there is something more to be said than the fact that we now have in Queensland a type of sheep able, to a great degree, to withstand hardship and generally scratch for his living, and that is on the question of finance.

A comparison of gross figures received from the two types of sheep under review would be surprising to most people. Manufacturers continue to preach quality, but are their buyers paying the price in proportion? Even at present low values it is safe to say that the well-bred Western merino would beat the Saxony type on actual figures by three to four shillings per head.

So much then for the result of figures, but of greater importance still is the fact that the grower of the type of sheep advocated has a great chance of pulling his flock through during periods of drought, whereas in the case of the superfine type the chances are all against him.

The advice we frequently get from manufacturing centres with regard to our loss in quality is mainly in the nature of a scare.

Australia, generally, is still the world's fine wool country, and by virtue of her geographical position and other considerations is likely to remain so.

This continent of ours, looked at from a pastoral point of view, is a very large place, and there is plenty of room for the breeding of all sorts of qualities to suit the different trade requirements. Above all, let the breeder of merino sheep breed according to his country and rainfall, and as regards Western Queensland in particular, let the breeder be advised, when in doubt, to lean towards constitution rather than the sacrifice of it.

One live sheep is better than a great many dead ones, and all sorts and conditions require the same feeding.

Personally, I hold no brief, as these notes may indicate, for the strong-woolled type of merino as against the fine-woolled sheep, except where it is clearly shown by the nature of the country that the selection of the type chosen mainly for constitution spells the difference between success and failure. A safe maxim for breeders to follow is:—Select the type of sheep most suited to your country, the rainfall, or lack of it, and stick to that type.

Finally, leave it to the manufacturer to "get the wind up" with regard to quality in our flocks. His interests are, of course, best served when he can purchase a 90 quality wool proportionately cheaper than a 66 count. It matters not in the least to the manufacturer or his buyer from what type of sheep his wool comes, whereas to the grower, who has to keep his flock alive at great expense, it matters a great deal.

Our breeders, taken generally, are not on the wrong track, and always provided they do not go to the other extreme with regard to constitution as against quality, and provided the industry gets some protection with regard to the export of our stud sheep, there is no need to fear the competition, except in a healthy way, of any country.

Australia has justly earned, and should be able to maintain, her fame as the chief merino country of the world.

Every true merino wool man loves to see and handle a fleece of super-quality wool, but the greatest of care should be taken, in the West of Queensland at any rate, to see that the constitution of our flocks is not sacrificed to quality.

At the time of speaking, the wool and sheep industry is in a depressed state owing to the drop in the price of wool. The country, too, has not had sufficient time to recover from the effects of the late drought, especially in the central districts.

When we remember that South Africa can produce wool at a cost of £5 per bale, whereas it costs us in Queensland in the vicinity of £19 per bale, it should give even the most uninitiated seriously to consider as to our economic conditions. South Africa, too, is nearer the world's markets. Is it right, then, to permit the export of our stud sheep, both ewes and rams? I would suggest that the export should be, at least, rigidly controlled even if not altogether prohibited.

The Department of Agriculture and Stock has, on figures supplied it by the Registrar-General, estimated that, provided no drought losses occur before the end of June next, there will be an increase of approximately 2,000,000 sheep, and 44,000 bales of wool over the period mentioned, in Queensland. Judging, however, on prices realised at the last June sales, it is estimated that even with this increase in sheep and wool the cheque to be divided amongst the growers will be approximately £1,000,000 less. What then is to be done?

Some advocate the reintroduction of the appraisement scheme which functioned so well during war years and afterwards; others assert that the cost of production must come down. These two methods both breathe of politics, with which this branch of the Department has nothing to do, but I unhesitatingly assert that there is one outlet in the growers' own hands. This is in the production of better sheep and of management generally. It costs just as much, and possibly more, to feed a bad sheep as a good one. Rigidly cull the breeding ewes, and spend a few guineas more on rams, being sure on expert advice, that the right type of ram is selected for the ewes.

It should be no very difficult thing for an interested breeder to put 1 lb. of wool per head on the flock over a period of, say, two years, without in any way sacrificing the constitution.

Beware of overstocking. To some extent the insurance of stock is in the owner's own hands. Dry periods have always been in the West and Central parts of Queensland, and one is far safer and surer of a profitable return when carrying numbers well within the capacity of the holding.

Maintain the health of the flock by the supply, when necessary, of a scientific lick making up for the deficiencies in the pastures ascertained after analysis.

Watch carefully for the appearance of worms, and drench before the damage is done. A neglected infestation of worms may quite easily reduce the value of the clip by one-half, besides the losses which would occur.

Change the flocks from pasture to pasture. A change to an apparently worse paddock will often benefit a flock.

Use discretion with regard to grass seed. Choose the most suitable season of the year for shearing.

Mate the rams so as to lamb at a time proved best in the district, and in general give the flocks that care and attention to which they so readily respond.

A great sum of money is lost to the growers of wool annually by faulty wool-classing. Evidence of this is seen in the various wool stores year after year. Employ only those classers thoroughly recommended. Both good classers and others are paid at the same rate. Why not employ a good man in this very necessary and important work?

At the present time this fair State of ours requires the individual help of every owner in the sheep and wool industry. Personal gains brought about by better sheep and better management are gains to the State also, and this should be the object of every owner.

DAIRY FODDER PLOTS.

By A. E. GIBSON, Instructor in Agriculture, and C. S. CLYDESDALE, Assistant Instructor in Agriculture.

The subjoined notes have already appeared in the Journal, and are reprinted in response to numerous requests from our readers in several districts in the State. They are of particular interest and value at the present time.—Ed.

THE majority of farmers engaged in dairying do not appear to realise the advantages to be gained by the growing of crops to supplement pastures to tide their stock over the leaner months of the year.

With the object of introducing the system throughout the Northern, Central, and Southern coastal districts, where reliance is usually placed on Paspalum, Rhodes, and other grasses, certain crop trials were instituted by the Department of Agriculture and Stock to determine the best single crops or crop mixtures for the purpose, and to demonstrate also that the methods, as practised, are not out of reach or too elaborate for the dairy farmer to undertake.

In Southern Queensland the undermentioned farmers co-operated in carrying out trials with Dairy Fodder Plots during the past season:—A. Hulse, Yandina, North Coast line; F. C. Burton, Bridges, North Coast line; and J. B. Stephens, Nindooimbah Estate, Beaudesert.

The soil on Mr. Hulse's farm is a deep, alluvial type of dark-grey loam, fairly rich in humus, which has been under crop, principally maize, for several years. That on Mr. Burton's farm is a deep, light-red coloured, sandy loam, which has been under sugar-cane for a number of years, and, consequently, somewhat deficient in available plant food. Mr. Stephens's property is composed of rich, black, alluvial soil, situated on the banks of the Albert River, and is practically new ground, having produced only two crops, subsequent to which it was fallowed during the summer months.

No fertilisers were used on this occasion on any of the plots.

The rainfall recorded at Yandina Railway Station, which is ¾ mile from Mr. Hulse's, and 3 miles from Mr. Burton's property, was—

Month.	Points.	No. of Wet Days.
March	1,059	9
April	1,110	10
May	357	5
June	716	11
July	643	6
August	183	1
September	172	5

The rainfall for Beaudesert was—

Month.	Points.	No. of Wet Days.
March	487	13
April	453	13
May	213	11
June	792	9
July	652	6
August	31	2
September	205	12

Cultivation.—At Yandina the land occupied by plots was ploughed late in February, to a depth of 8 in., immediately after the removal of a crop of maize (grain), but turned up in a very rough condition; and later on, in March, was cross-ploughed and, prior to planting, was reduced to a fine tilth by means of the disc-cultivator, followed by the harrows.

At Bridges the land was ploughed and harrowed in March, and cross-ploughed and harrowed in May; these operations resulted in an excellent seed-bed.

PLATE 47.—PRINCE WHEAT AND VETCHES AT MR. A. HULSE'S FARM, YANDINA.

PLATE 48.—PRINCE WHEAT AND VETCHES AT MR. F. E. BURTON'S FARM, BRIDGES, N.C. LINE.

The plot at Nindooimbah was fallowed during the summer, and before planting was again ploughed, thus making a perfect seed-bed.

Sowing.—The heavy rain experienced in March and April delayed planting operations. The soil was not dry enough to plant until 16th May, which, under the circumstances, was rather too late to expect early supplies of Winter fodder.

At all plots the usual local practice of broadcast sowing was followed, seed drills being unavailable. When used in mixtures, peas and vetches were sown first and "disced" in, the cereals being sown on the disced surface—once harrowed, and then rolled.

The majority of the plots made rapid progress, particularly the early-maturing varieties.

Description and Varieties on North Coast.—The two varieties of wheat experimented with—"Prince" and "Patriot"—appear to be suitable for the coastal districts, being practically free from rust, and made excellent growth. When harvested, they averaged 5 ft. in height.

Ruakura and Algerian oats suffered considerable damage owing to excessively wet weather, causing them to lodge, and to be badly affected by rust. They reached a height of 3 ft. at time of harvesting.

Skinless barley suffered badly from the effects of rust, which appeared when the crops were 2 ft. high, in the "shot blade" stage.

Cape barley did fairly well, and when harvested averaged 4 ft. in height, producing a large amount of foliage, and showing only slight indications of rust.

Rye made quick growth, looked remarkably well throughout the growing season, and, when harvested, averaged 5 ft. in height.

In all plots the field peas did remarkably well, making vigorous growth throughout, and, when harvested, averaged 4 ft. 6 in. in height.

Vetches, which are usually rather slow in growth, produced a fair amount of foliage, and, when harvested, averaged 4 ft. in height.

Plots at Nindooimbah.—Throughout the plots, peas and vetches were considerably overgrown by the other cereals used, thus affecting the subsequent yields of fodder. The varieties of wheat—"Prince" and "Patriot"—made excellent growth, stooling well, and having but slight indications of rust. Although they were knocked about considerably by wind and rain prior to harvesting, they did not suffer any serious damage.

Skinless and Cape Barley.—During the early stages of growth, these varieties suffered damage from excessive rains, which caused them to lodge; opportunity was taken to make a first cutting, this being effected ten weeks from the date when the young plants first appeared above the ground. A subsequent cutting was made at a later date, details of which appear in tabulated form. Cape barley made most remarkable growth, but that of "skinless," subsequent to the first cutting, was somewhat thin.

Ruakura and Algerian Oats.—The former, being much the earlier of the two varieties, stooled well, and resulted in a much heavier growth. Later on, however, it showed an inclination to lodge, and to rust. The Algerian oats were somewhat later in maturing, but stooled well; this crop also showed an inclination to lodge, and a susceptibility to rust.

Rye.—Owing to its early-maturing habits and favourable conditions, the rye made rapid growth, and was harvested on 13th August, averaging 5 ft. in height at the time.

By using a little judgment in selecting the right varieties to grow, and getting the first sowing in, say, towards the end of March or April, a plentiful supply of green fodder should be available from early August until practically the end of October, by which time the spring growth in pastures should be well advanced.

In all plots, each of which contained one-tenth of an acre—

Wheat was sown at the rate of 60 lb. per acre.
Barley was sown at the rate of 50 lb. per acre.
Oats was sown at the rate of 40 lb. per acre.
Rye was sown at the rate of 60 lb. per acre.
Field peas was sown at the rate of 30 lb. per acre.
Vetches was sown at the rate of 20 lb. per acre.

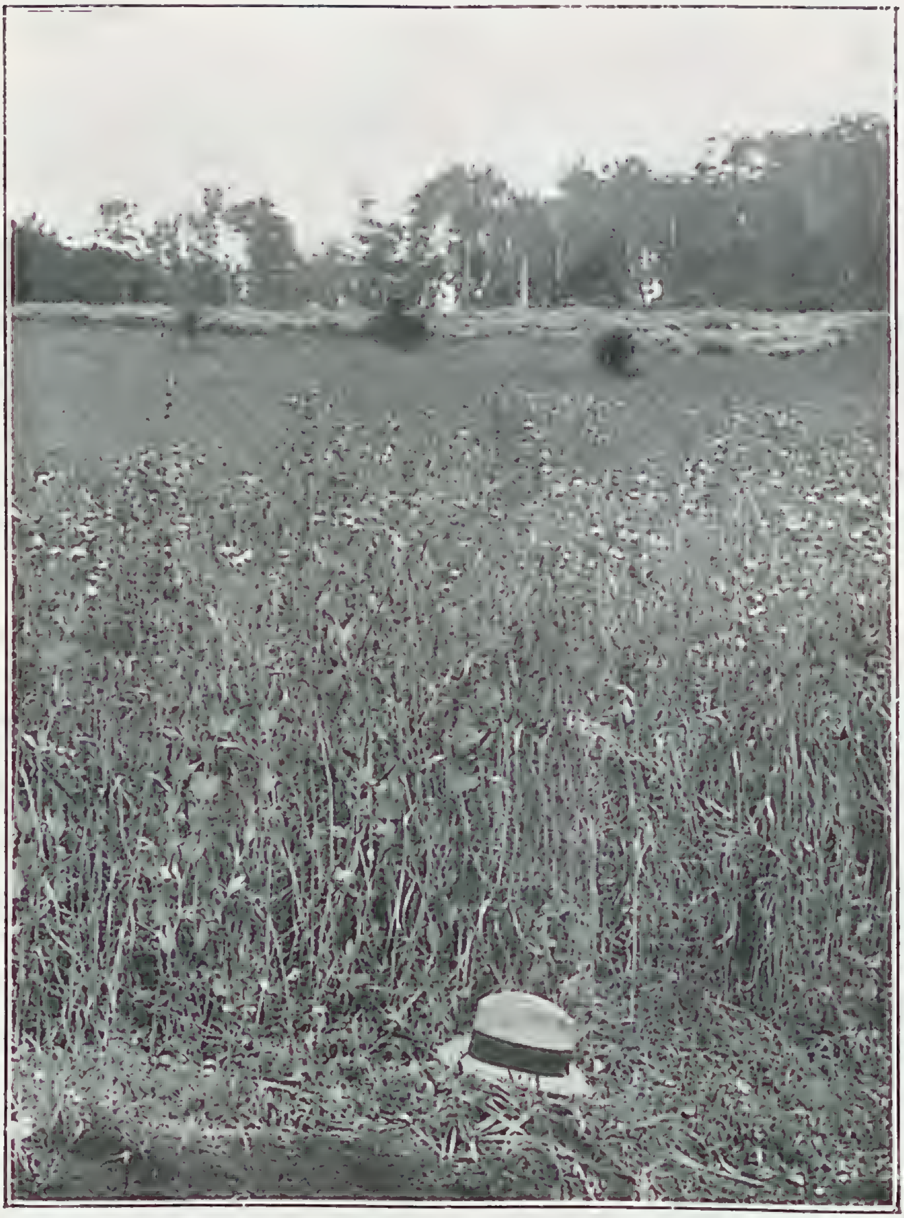

PLATE 49.—PATRIOT WHEAT AND FIELD PEAS AT MR. F. E. BURTON'S FARM, BRIDGES, N.C. LINE.

RESULTS.

Varieties.	Yields per Acre of Green Fodder.											
	A. Hulse, Yandina.				F. G. Burton, Bridges.				J. B. Stevens, Nindooimbah.			
	T.	C.	Q.	LB.	T.	C.	Q.	LB.	T.	C.	Q.	LB.
Prince wheat and peas	16	16	2	12	2	14	0	2	13	10	0	10
Prince wheat and vetches..	10	16	0	8	6	1	2	4	11	17	2	20
Patriot wheat and peas	16	4	0	12	9	2	0	0	14	0	3	16
Patriot wheat and vetches	11	6	3	4	2	0	2	1	12	18	1	26
Rye and peas	10	16	0	8	5	5	1	9	14	11	2	22
Rye and vetches	7	11	1	0	Destroyed by wallabies				16	4	0	22
Cape barley and peas	12	3	0	9	10	16	0	8	13 (two cuttings)	10	0	10
Cape barley and vetches	7	11	1	0	2	19	1	19	15	2	2	0
Skinless barley and peas	11	6	3	14	Destroyed by wallabies				5	18	3	10
Skinless barley and vetches	5	13	1	21	Destroyed by wallabies				5	2	2	15
Ruakura oats and peas	9	9	0	7	4	3	2	25	18	18	0	14
Ruakura oats and vetches	7	11	1	0	Destroyed by wallabies				17	16	2	2
Algerian oats and peas	8	18	1	1	3	6	0	19	9	3	2	18
Algerian oats and vetches..	6	15	0	5	Destroyed by wallabies				9	14	1	24

The yields generally on Mr. F. G. Burton's plots were reduced by the depredations of wallabies.

PLOTS AT TOOGOOLAWAH.

For some years the Department of Agriculture has endeavoured to interest dairymen and stockowners generally in the matter of fodder provision for their herds during those periods when, by reason of the lack of succulence in the natural pastures, yields from their herds have been considerably lessened, and, in some cases, even reduced within measurable distance of vanishing point.

The practice of arranging with interested farmers to carry out trials designed and supervised by officers of the Department, has met with a good deal of success. The results to date have clearly shown that by early and careful preparation, heavy returns are readily available of rich, succulent, milk-producing fodders, and that a continuity of this class of food can in normal seasons be kept up to tide milch cows over periods during which their productivity is affected by the gradual depression, induced in each animal's system, by being called upon to make use of rough grasses of low nutritive value, at a time when weather conditions were at their worst.

Ocular evidence has shown that improved milk supplies and a correspondingly improved return from the factory is inducement enough for other neighbouring farmers to profit by the example of the one who first adopted the system of growing crops regularly, for his dairy stock—actually, on a farm, an inexpensive method of maintaining an income.

In the present crop trials carried out on Mr. T. Coleman's property at Toogoolawah, no fertilisers of any kind were used. The plots were situated on well-prepared alluvial soil near Cressbrook Creek, which had been under cultivation for a number of years.

The plots were sown on 31st March, 1925, and were harvested for yield-computing purposes on 30th July, 1925, consequently each yield submitted represents four months' growth of fodder, and judged on this basis may be considered as highly satisfactory.

A more vigorous growth was noticeable in the case of Florence wheat and peas or tares and the Skinless barley with a similar mixture, both of which were well out in ear and rapidly maturing; rye had made a dense growth in both instances, but only a few heads were to be seen, and probably a further three or four weeks would be

required to bring it to a similar state of maturity to that obtained by the Florence wheat at date of harvesting. The following yields were recorded:—

	Per acre.			
	Tons.	cwt.	qr.	lb.
Florence wheat and peas	7	14	1	4
Cape barley and peas	9	11	1	0
Skinless barley and peas	10	15	1	0
Rye and peas	8	10	1	12
Algerian oats and peas	8	3	3	20
Canary seed and peas	11	8	0	24
Florence wheat and tares	7	4	2	16
Cape barley and tares	9	0	0	0
Skinless barley and tares	11	1	3	4
Rye and tares	12	13	3	20
Algerian oats and tares	10	15	1	12
Canary seed and tares	8	10	1	12

PLATE 50.—FLORENCE WHEAT AND TARES AT T. COLEMAN'S, TOOGOOLAWAH.
Yield—7 tons 4 cwt. 2 qr. 16 lb. per acre.

In view of the fact that some of the plots might be regarded as too immature for the purpose of obtaining the maximum yield, further weighings for comparative purposes were made on the 24th August, with the following results:—

	Per acre.			
	Tons.	cwt.	qr.	lb.
Alberian oats and peas	11	9	3	12
Rye and peas	8	13	2	8
Canary seed and peas	7	17	2	0
Algerian oats and tares	13	19	2	6
Rye and tares	9	9	2	16
Canary seed and tares	13	14	3	8

When selecting fodders for the test, cognisance was taken of their respective periods of maturity so that a continuity in the supply of green fodder might be kept up. Obviously the grower by using judgment in the matter of arranging for succession sowings should readily be able to maintain his supplies, and in this way ensure a more regular state of productivity in his herd.

Observations made respecting the period of development of the different crops were as follows:—Florence wheat and Dun field peas were ready for use earlier than any other single crop or combination, followed by crops in the order named: Florence wheat and tares, Skinless barley and peas, Cape barley and peas, Skinless barley and tares, Cape barley and tares, Rye and peas, Rye and tares, Algerian oats and peas, Algerian oats and tares, Canary seed and peas, Canary seed and tares.

Observations made indicate that it is advisable when arranging for mixtures of crops to confine the sowing of peas to the early-maturing cereals—Florence wheat, Skinless and Cape barley—as the peas begin to lose weight as they approach maturity.

Plate 51.—Florence Wheat and Dun Field Peas at T. Coleman's, Toogoolawah.
Yield—7 tons 14 cwt. 1 qr. 4 lb. per acre.

Tares on the other hand have a longer growing period and retain their succulence better than the field peas, consequently they are more suitable for use with Algerian oats, Canary seed, and Rye.

To those dairymen who are interested in maintaining supplies to their respective factories throughout the winter period, the following quantities are recommended for use in connection with the above class of fodders:—

Wheat 30 lb., Dun field peas or Black Tares 20 lb.
Barley 40 lb., Dun field peas or Black Tares 20 lb.
Rye 30 lb., Dun field peas or Black Tares 20 lb.
Oats 30 lb., Dun field peas or Black Tares 20 lb.
Canary seed 10 lb., Dun field peas or Black Tares 20 lb.

DRY SEASONS—A COUNTERING FIELD CAMPAIGN.

The loss of national wealth to this State brought about by periods of drought cannot be accurately estimated by figures—but their effects are undoubtedly far-reaching. If action can be taken over certain areas whereby increased production can be brought about, it naturally follows that dry periods are robbed to some extent of their devastating influences and the loss to the State as a whole is decreased. A policy of this kind is naturally educative in its character to all, but when certain sections are dealt with it becomes more particularly of value to those directly interested, and this is increased when illustrations are given for the purpose or proving the policy advocated.

For some time past the Department of Agriculture and Stock has interested itself in increased production of dairy and allied products, and with this object in view has initiated a series of fodder trials in various distrcts for the purpose of pointing out that if means are adopted for the annual provision of fodder crops for dairy stock and pig raising, the fluctuations which have in the past taken place in the supply of these products will be considerably reduced if not entirely removed.

PLATE 52.—CAPE BARLEY (in shot blade stage) AND DUN FIELD PEAS AT T. COLEMAN'S, TOOGOOLAWAH.
Yield—9 tons 11 cwt. 1 qr. per acre.

Losses to dairymen and others, brought about by lessened production during dry periods, are often serious, and attention is drawn to the fact that these can be considerably reduced by adopting the policy of careful soil preparation and the sowing of crops calculated to fill the void caused by the absence or decreased supplies of natural grasses and herbage.

It was with such an object that dairy and pig fodder trials were established on the farms of Messrs. F. W. Thiedeke and Peel Caswell, of Beaudesert and Wangalpong respectively, and results obtained so far from portions of these plots

Plate 53.—Peas and Pilot Wheat at F. W. Thiedeke's, Beaudesert (Fodder Plots).

Weight—10 tons 13 cwt. 2 qr. 19 lb. per acre.

Plate 54.—Peas and Florida Wheat at F. W. Thiedeke's, Beaudesert (Fodder Plots).

Weight—11 tons 17 cwt. 2 qr. 20 lb. per acre.

PLATE 55.—PILOT WHEAT AND PEAS AT P. CASWELL'S, WANGALPONG (FODDER PLOTS).

PLATE 56.—FLORIDA WHEAT AND VETCHES AT P. CASWELL'S, WANGALPONG (FODDER PLOTS).

have proved the soundness of the principle involved. Both farmers are capable agriculturists whose methods of cultivation leave little to be desired, and who are fully seized of the importance of fallowing and thoroughly preparing their land prior to seeding operations. The results obtained on the comparatively low rainfall experienced at Wangalpong speak for themselves; and whilst the soil at Beaudesert is of a heavier nature than that met with in parts of the Canungra Valley, the heavier rainfall experienced more than compensated for the difference in soils and their moisture-retaining qualities.

The plots were planted on the 9th and 10th June at Mr. Thiedeke's at Beaudesert, whilst those at Mr. Caswell's, at Wangalpong, were planted on the 12th and 14th of June. Rainfall experienced between the 9th June and 23rd September (the date of harvesting) at Mr. Thiedeke's being 3.66 inches, but it must be noted that a fall of 1.06 inches was experienced on 7th June, two days prior to planting. At Mr. Caswell's the rainfall received between the 12th June and 24th September totalled .91, the previous rains to that date being 1.25 inches, registered on 14th and 17th May.

The following weights of green fodder were recorded:—

	Mr. F. W. Thiedeke, Beaudesert.				Mr. P. Caswell, Wangalpong.			
	Tons.	cwt.	qr.	lb.	Tons.	cwt.	qr.	lb.
Florida wheat and peas ..	11	17	2	20	7	6	1	22
Florida wheat and tares ..	10	8	3	13	7	4	0	5
Pilot wheat and peas ..	10	13	2	19	8	5	2	17
Pilot wheat and tares ..	10	4	0	7	6	12	0	5
Skinless barley and peas ..	11	8	0	8	6	4	3	10
Skinless barley and tares ..	4	16	0	3	7	1	2	16
Cape barley and peas ..	6	2	1	21	4	18	1	20
Cape barley and tares ..	9	7	1	1	4	16	0	3
Rye and peas	5	15	0	27	4	16	1	20
Rye and tares	8	0	3	11	3	7	0	25

The varieties of wheats used in the trial were Pilot, a Bunge-Florence crossbred, and Florida, a Bobs-Florence crossbred, both of which were raised at Roma State Farm. These varieties made excellent growth, and were remarkably even throughout the trials. At the time of harvesting both varieties were in the flowering stage, averaging 3 feet 6 inches in height.

At Wangalpong both Pilot and Florida showed signs of flag-rust, but at Beaudesert no signs of rust were apparent. This was probably due to local conditions and to the fact that humidity in the Canungra Valley is greater than in the more open areas around Beaudesert.

Cape Barley.—This crop made fair growth, and when harvested was in the shot-blade stage—the height averaging 1 foot 9 inches of good healthy growth. From the general appearance of the crop a later cutting will give a heavier yield.

Skinless Barley was a clean and attractive crop, averaging 3 feet in height, which had made a remarkable growth of foliage. When harvested the grain was in the soft dough stage.

Rye.—In each case this crop made rapid growth, and was in the flowering stage when harvested, averaging 3 feet in height. Generally speaking, growth was somewhat on the thin side, and heavier quantities of this cereal should be sown when the season is somewhat advanced, as it was in this particular instance.

Field Peas in all plots made fair average growth of 1 foot 6 inches in height. When harvested they showed signs of wilting, thus reducing the weight per acre that under other conditions would have been recorded.

Vetches, usually rather slow in maturing when compared with peas, made favourable growth.

The pig fodder plots were not sufficiently far advanced in growth on 23rd September to justify their harvesting, consequently this matter was deferred till 24th November, but during this period a further rainfall of 326 points was received and recorded as follows:—25th September, 32 points; 28th September, 166 points; 16th October, 46 points; 25th October, 9 points; 16th November, 73 points; total, 326 points.

As a result increased growth was in evidence compared with that shown on the occasion of the previous visit.

As in the case with the dairy plots, Mr. Caswell had given careful attention to the cultivation of the various fodders, and an entire absence of weed growths was noticeable.

The various yields recorded can be regarded as valuable illustrations of what can be accomplished by careful and systematic cultivation of crops that are suited for purposes of economic pig feeding and can be produced at little cost to the grower.

The following are the yields recorded:—

	Per acre.			
	Tons.	cwt.	qr.	lb.
Thousand Headed kale	11	15	3	3
Dwarf Essex rape	6	9	2	16
Yellow Globe mangels	29	8	1	20
Long Red mangels	23	19	2	12
Purple Top Swede turnips	14	18	0	27
Elephant Swede turnips	12	13	3	18
Sugar beet	17	6	2	12
White Belgian carrots	12	13	3	18

The Dwarf Essex rape suffered somewhat from the attacks of Aphis, whilst the foliage of the Swede turnip was subjected to the attentions of the Rutherglen Bug; otherwise the crops were excellent in every respect.

QUEENSLAND SHOW DATES.

Following is a list of show dates for 1930, so far approved by the Queensland Chamber of Agricultural Societies:—

FEBRUARY.	
Stanthorpe	5-7
Killarney	28—1 Mar.
MARCH.	
Allora	5-6
Clifton	12-13
Tannymorel	15
Milmerran	18
Pittsworth	20
Goondiwindi	20-21
Warwick	25-28
Toowoomba	31—3 Apr.
APRIL.	
Dalby	8-9
Oakey	11
Sydney Royal	15-26
Miles	16
Chinchilla	22-23
Beaudesert	30—3 May
MAY.	
Goombungee	2
Taroom	5-7
Mundubbera	7-8
Boonah	7-8
Blackall	13-15
Roma	13-14
Gayndah	14-15
Ipswich	20-23
Wallumbilla	20-21
Springsure	21-22
Kilkivan	21-22
Biggenden	22-23
Maryborough	27-30
Toogoolawah	30-31
JUNE.	
Marburg	3
Gin Gin	5-7
Lowood	13-14
Gladstone	18-19
Mount Larcom	20-21
Rockhampton	25-28
JULY.	
Mackay	1-3
Gatton	9-10
Townsville	8-10
Rosewood	18-19
Caboolture	17-18
Nambour	23-24
Esk	25-26
Maleny	30-31
AUGUST.	
Royal National Association ..	11-16
Crow's Nest	27-28
SEPTEMBER.	
Beenleigh	19-20
Rocklea	27

Answers to Correspondents.

BOTANY.

The following answers have been selected from the outgoing mail of the Government Botanist, Mr. C. T. White, F.L.S.:—

Grasses and Clovers.

E.B. (Tailevu, Fiji)—

We do not know the grass you describe, it sounds a bit like Rhodes Grass (*Chloris Gayana*) which might do well in some parts of Fiji, and seed of it is procurable through any reputable seedsman either at Sydney or Brisbane.

We are not at all sure of this, and would suggest that you send a specimen seed head and leaf for identification.

In regard to grasses in North Queensland, on the coast where conditions are somewhat similar to those of Fiji, the outstanding grass from a dairying point of view is the Para Grass (*Panicum barbinode*), generally known in Queensland as *Panicum muticum* or Giant Couch. Of similar habit, but of rather finer growth, is the Kikuyu (*Pennisetum clandestinum*). Both the Para and Kikuyu are almost invariably grown from cuttings, not from seeds. A bigger grass that could be used for combined grazing and cutting you might try Soudan (*Sorghum soudanense*) and Elephant Grass (*Pennisetum purpureum*). Seeds of both of these are procurable, of course, from any reputable seedsman in either Sydney or Brisbane. We do not think you will have any success at all with clovers in Fiji, as these are essentially temperate plants. The only clover that does any good at all in Queensland is the ordinary White Dutch, *Trifolium repens.* Lucerne should do quite well on arable land. Allied to the clovers are the Medick Burrs or Burr Trefoils, Medicago species, or which the commonest is *Medicago denticulata,* very common in Queensland and New South Wales, though we do not know whether seed is stocked by nurserymen. These plants are not of annual duration, but come up with the winter rains, and provide feed during winter and spring when other grasses and herbage are more or less absent or at a stand still.

A plant that has overrun a good deal of North Queensland of recent years is *Stylosanthes mucronata,* known as Wild Lucerne. Like Burr Trefoil it is of annual growth, but is a summer not a winter feed. It provides excellent forage comparable to lucerne in nutritive value. I do not think seed is stocked by seedsmen in the ordinary way, but if you wrote to the Instructor in Agriculture, at Townsville, N.Q., he might be able to put you in touch with a supply. This officer (Mr. N. A. R. Pollock) should be able to give you some useful information about fodders for your part of the world, as conditions in his district are comparable to those in Fiji.

Grass for Golf Links.

INQUIRER—

The best all-round grass for golf links near Bowen would be the Common Couch (*Cynodon dactylon*). The Blue Couch (*Panicum didactylum*) should also do well in the locality. A grass that lies flat on the ground in North Queensland and makes a fairly close turf is the broad-leaved form of *Paspalum platycaule.* This does particular well near the sea. We do not know that seeds are obtainable, but the plant is easily propagated by roots.

PIG RAISING.

(Selected from the outward mail of the Senior Instructor in Pig Raising, Mr. E. J. Shelton, H.D.A.)

Paralysis in Pigs.

A.E.C. (Inglewood)—

Tell us more about the symptoms of the trouble, and describe your methods of handling and feeding your pigs. Bush ticks are often the cause of paralysis in young pigs. Ordinary hog lice do not actually poison the pig, but their continual irritation results in loss of rest and in reduced condition.

Seaweed as Fertiliser.

H.A.P. (Karragarra Island)—The Agricultural Chemist, Mr. J. C. Brünnich, advises as follows:—

The composition of seaweed varies very considerably. Roughly speaking, the seaweed has about the same value as a good stable compost, and it would be always best to collect it in stacks and allow it to rot. Mr. Brünnich's analysis of your sample:—

		Per cent.
Moisture and organic matter	=	76.0
Salt (NaCl)	=	4.7
Lime estimated as CaO	=	5.8
Nitrogen	=	1.2
Phosphoric acid as P_2O_5	=	0.2
Potash as K_2O	=	0.8

This material has some manurial value and would be worth collecting, but could not stand much transport costs. It would unquestionably be much more valuable if allowed to rot and consolidate made into a compost heap.

Pollen Substitutes

R.W. (Gympie)—The Agricultural Chemist, Mr. J. C. Brünnich, advises as follows:—

Freshly prepared maize meal is undoubtedly superior to commercial maize meal as a pollen substitute, and it is unquestionably the finely ground germ which is the most valuable part. The germ is really a part of the ovum and the composition of this and pollen closely related. A good quality of pollen contains about 5 per cent. water, 30 per cent. proteins, 5 per cent. starch, 15 per cent. sugars, 40 per cent. other carbohydrates, fats, wax, ash, &c., and is naturally rich in vitamines, which are present only in very minute amounts, but which are the most indispensible and most difficult to replace. Bees when starving for pollen, use all kinds of substitutes, and their instinct does not show which are the best, they have been known to collect sawdust, coal dust, soil, &c. When giving substitutes like flour, of which rye flour appears to be the best, and other meals, it will be difficult to ascertain with absolute certainty which is the best, unless all other sources of real pollen are excluded. Milk has been found valuable, but decomposes too quickly, but I think it very probable that milk powder, like "true food" mixed in small amounts with flour or pollard would be found valuable. An ideal food would be the yolk of an egg, if it could be mixed with flour, dried and ground up again. Any strong heating must be avoided as it is likely to destroy vitamines. I have no hope in fungus spores, smut, &c., being ever utilised, and in many cases would be dangerous, as spores are frequently poisonous.

TWO MILLION TREES.

Two million young rubber trees are now being planted in the Dunlop Plantations, Malaya, section by section as the heavy tropical jungle is cleared and its soil prepared over an area of 16 square miles.

In ten years' time it is expected that the new trees will yield an annual crop of 5,000 tons of rubber. At present 8,500 tons of rubber a year is being tapped from 4,000,000 trees.

Every other day a very thin strip of bark is cut from each tree and the fluid rubber drips into the cup below. As each cup receives, on the average, only half an ounce of dry rubber daily, between 600,000,000 and 700,000,000 capfuls of it have to be collected in the course of twelve months.

One third of the native workers are Chinamen, but the bulk of them are Tamil specially recruited from the south of India. Temples for their worship are built by the Dunlop organisation, which also provides houses and hospitals for them, schools for their children, and rice at cost price.

Golf courses have been laid down for the European staff, whose Rugby team is making a bid for the championship of Malaya.

Early next year the dense jungle is to be tackled over a further 16 miles on the Dunlop territory, which is more than 125 miles in extent.

General Notes.

Staff Changes and Appointments.

Mr. P. L. Barry has been reappointed Government Representative on the Tambo Dingo Board.

Mr. M. Maloney, of Meandarra, has been appointed an Acting Inspector of Stock at Meandarra.

Mr. C. H. S. Wills, of Aramac, has been appointed Government Representative on the Aramac Dingo Board.

The appointment of Mr. O. H. Webb as Acting Inspector of Stock has been cancelled as from 31st December, 1929.

Mr. Charles Bradbury has been appointed an Officer under the Animals and Birds Acts, as from 28th December, 1929.

The appointment of Mr. J. J. Shelvey, as Inspector of Stock at Crow's Nest, has been confirmed as from 6th June, 1929.

Messrs. C. N. Morgan, W. G. Hancock, and A. J. Browne have been appointed Temporary Inspectors under the Diseases in Plants Act.

Mr. R. J. T. Kidd, Inspector of Stock, Normanton, has been reappointed Government Representative on the Carpentaria Dingo Board.

The appointment of the Officer in Charge of Police at Sapphire as an Acting Inspector of Stock has been cancelled as from 31st January, 1930.

The appointment of Mr. J. L. Hodge as Instructor in Sheep and Wool, Department of Agriculture and Stock, has been confirmed as from 4th June, 1929.

The appointments of Messrs. W. J. Sheahan and E. C. Dunn as Inspectors under the Diseases in Stock Act have been confirmed as from 6th June, 1929, and 4th June, 1929, respectively.

Mr. F. C. Shaw, of Maryborough, has been appointed a Temporary Inspector of Slaughter-houses from 2nd January to 4th February, 1930, during the absence of Mr. E. C. Todd, on leave.

Messrs. V. A. Spyve and J. D. Ferricks, Police Constables, have been appointed Inspectors under the Slaughtering Act as from 13th December, 1929, and 26th December, 1929, respectively.

Messrs. T. I. Parker and William Law, of Goodna, and Mr. H. M. Johnstone, of Ashgrove, have been appointed Honorary Rangers under the Animals and Birds Acts, as from the 14th December, 1929.

Acting Sergeant T. Smith, of Surat, has been appointed an Inspector under the Brands Act; Constable R. J. Nesbit, of Kalbar, has been appointed a Slaughtering Inspector; and the Officer in Charge of Police at Atherton has been appointed an Acting Inspector of Stock.

Mr. J. H. Buzacott has been appointed Assistant Entomologist, Bureau of Sugar Experiment Stations, Department of Agriculture and Stock, as from 1st January, 1930; and Mr. N. G. Cassidy has been appointed Research Assistant, Bureau of Sugar Experiment Stations.

Mr. W. D. Cameron has been reappointed Government Representative on the St. George Dingo Board; Mr. R. C. Lethbridge has been reappointed Government Representative on the Booringa Dingo Board; the Police Magistrate, Ingham, has been reappointed Government Representative on the Kennedy Dingo Board; Mr. T. Law has been reappointed Government Representative on the Adavale Dingo Board; and the Inspector of Stock at Charleville has been reappointed Government Representative on the Warrego Dingo Board.

Pineapple Levy, Term Extended.

Regulations providing for a levy to be made on all pineapples marketed in Queensland were passed on 14th January, 1926, and extended until 24th January, 1930, on 15th March, 1929. The levy is made by the Committee of Direction of Fruit Marketing, and is at the rate of ½d. per case, or, in the case of being sold loose, at ½d. per forty-two rough or ripley pineapples, or at the rate of ½d. for every twenty-four smooth pineapples. A regulation has now been passed extending the levy to include all pineapples marketed in Queensland until 24th January, 1931.

A Laidley Sanctuary.

An Order in Council has been passed declaring Reserve R. 132, known as Dyer's Swamp, Laidley, as a Sanctuary under the Animals and Birds Acts; thus it will be unlawful for any person to take or kill any animals or birds in this area.

Egg Board Election.

Nominations will be received by the Returning Officer, Department of Agriculture and Stock, Brisbane, until 20th February, 1930, for election for one year as from 1st April, 1930, as growers' representatives on the Egg Board. Five such representatives are to be elected, and each nomination is to be signed by at least ten growers of eggs who own fifty fowls or more.

Atherton Tableland Maize Board.

Nominations will be received by the Returning Officer, Department of Agriculture and Stock, Brisbane, until 5 p.m. on 17th February, 1930, for election as growers' representatives on the Atherton Tableland Maize Board. Five such representatives are to be elected by growers who, subsequent to 24th March, 1929, grew for grain within the Petty Sessions District of Atherton, Herberton, or Chillagoe. at least 1 acre of maize and delivered the product of same or part of same to the Board for sale. Each nomination is to be signed by at least ten growers as above.

Canary Seed Board.

The definition of "Growers of Canary Seed," as stated in the Order in Council dated 23rd December, 1927, constituting the Canary Seed Board, in paragraph 4, has been amended. The definition now reads as follows:—

> "(4.) The class of persons who shall be deemed to be growers of such commodity and eligible to vote at any referendum or election in connection with the said Board shall be persons who have grown or have growing canary seed for sale within a period of twenty-four months prior to any election or referendum held in connection with the said Board."

Over-Production of Milk.

Better attention to breeding had raised the average annual milk yield of all recorded from 599 gallons in 1917-18 to 673 gallons in 1927-28. So said Mr. J. F. Blackshaw, of the Ministry of Agriculture, before the Auctioneers' and Estate Agents' Institute (England). Dairy farming had in a comparatively few years grown from a localised industry to one which now represented more than 30 per cent. of the whole farming industry. There was some reason to think that unless the public could be induced to drink more milk, or unless more satisfactory provision were made for the manufacture of milk into products, the milk industry might, in the near future, suffer from over-production.

Another Thrice 2,000 Galloner.

Major C. F. Case's wonderful British Friesian cow Blickling Mist has added to her fame by completing her third 2,000-gallon yield.

Blickling Mist was bred by Mr. Thomas H. Case, but her working life has all been spent in the herd of Major C. F. Case, of Cockthorp, Wells, Norfolk. Born on 6th September, 1923, she has calved four times and milked as follows:—

14.551 lb. in 337 days in milk, 1926; 20,130 lb. in 310 days, 1927; 21,754½ lb. in 342 days, 1928; 20,527½ lb. in 248 days, 1929; total, 76,963 lb.

Blickling Mist has thus produced, with her first four calves, and in a total period of less than four years, 7,696 gallons of milk. Moreover, she has set up a new British record for production at six years old, her total output at such age being 7,325 gallons, an achievement which displaces Mr. James Calwell's wonderful Irish Friesian cow Ballyhill Brineen, who at the age of six had given 6,837 gallons.

Blickling Mist was reserve champion in the Open Milking Trials at the Royal Show at Harrogate in July last, on which occasion she gave 78 lb. of 3.37 per cent. milk, from which 2 lb. 12¼ oz. of butter were made. She also came second in the Open Butter Tests at Harrogate, and second in the last of the "Harold Jackson Trophy" competitions, her average annual yield for three successive years being 1,805.7 gallons, just insufficient to beat an eight-year-old cow that averaged 1,806.1 points over the same period.

Both the sire and the dam of Blickling Mist carry the blood of the bull Beccles Lodewijk, that sired no fewer than ten 2,000-gallon cows.—"Live Stock Journal" (England).

Banana Levy, Term Extended.

Regulations making provision for a levy on bananas were passed on 1st September, 1927. Such levy is payable by growers of bananas marketed in Queensland, and the rate of the levy is fixed at 1d. for every £2 or part thereof of the net proceeds realised from sales. The levy, which is made by the Committee of Direction of Fruit Marketing, operated until 31st December, 1929. A regulation has now been passed to include all bananas marketed until 31st December, 1930.

Rating of Agricultural Land.

The following interesting opinion is given by "Local Government," the organ of the Local Authorities Association of Queensland:—

Case.

I am instructed to write and inquire if an owner of agricultural land in the town area is entitled to differential rating? If so, must the land be used for agricultural purposes?

Opinion.

In my opinion the owner of the agricultural land referred to is not entitled to be rated at a lower rate than the general rate as of right, but if the local authority is of the opinion that the land is not in demand for building sites or residential areas and is being reasonably used for the purpose of primary production it may levy a lesser rate. (*See* section 233, as amended by the Act of 1923.)

Small Goods Sales—Amended Regulations.

An amendment has been passed to Regulation 49, under the Diseases in Stock Act, which provides that any small goods may be stored or sold in the same room as is used by the owner or occupier of a butcher's shop for the storage or sale of meat. The regulation now provides that small goods may be stored or sold by any person who does not sell or offer for sale fresh beef, except veal from carcasses of not less than 40 lb. or more than 80 lb. dressed weight, or mutton of any description.

The effect of this will be that small goods shops will be restricted to the sale of the following articles:—Bacon, brawn, brains, bread, butter, cheese, cooked meats, dripping, eggs, fish (smoked or cured), ham, kidneys, lard, mince, pies, pork, poultry (dressed), rabbits (dressed), sausages, scones, tinned and bottled foods, tongues, tripe, trotters, veal from carcasses of not less than 40 lb. or more than 80 lb. dressed weight.

Feeding of Dairy Cows.

Improper feeding of dairy cows is one of the chief causes of unprofitable dairying.

It is not contended that the heavy loss to the dairying industry brought about by insufficient feed during an adverse season could be wholly avoided by up-to-date methods of feeding, observes a recently issued pamphlet of the Department of Agriculture, but it can safely be stated that by the practice of proper methods of farming the dairyman would be in a much better position to face a period when providence does not treat him too kindly. Top-dressing of pasture land, conservation of surplus fodder, and the utilisation of farm-grown fodder crops in such a manner as to ensure their maximum feed value are practices which must be employed in order to obtain the best results. Most farm crops, with the addition of a small amount of concentrates, form excellent balanced rations, and by feeding the various fodders in this way their full nutritive value will be utilised by the animal and waste in feeding will be eliminated. Waste by improper feeding of farm crops is very commonly observed on dairy farms, whereas if these crops were utilised in the correct manner better results would be obtained from the herds at very little extra cost.

Hand-feeding of dairy cows is, comparatively speaking, not carried out very extensively in this country, and in many instances where the practice is being adopted the rations fed are prepared in such a manner, and with so vague a knowledge of the correct method of preparing a true balanced ration, that waste in feeding is the result. The cutting of valuable fodder crops and throwing them in the paddocks for the cattle to eat is still a general practice with many farmers. This method is not only wasteful, from the point of view of utilising the full nutritive value of the fodders, but is objectionable from another standpoint. Dairymen have no doubt noticed that by adopting this method of feeding their cows the herd is continually being disturbed by the strong robust animals with a keen appetite, who endeavour to obtain more than their share of the feed, with the result that the younger and weaker animals in the herd are deprived of their nourishment.

The A.I.F.

It is not generally known that the place of birth of members of the A.I.F. who sailed from Australia for the Great War was as follows:—Queensland, 28,253; New South Wales, 88,250; Victoria, 92,553; South Australia, 27,761; West Australia, 8,042; Tasmania, 13,104; United Kingdom, 64,221; New Zealand, 4,214; other British countries, 2,246; foreign countries, 3,437: total, 331,781. It will be seen from this summary that 77 per cent. of the men of the A.I.F. who left Australia for the front were native-born. The percentage of casualties to Australians engaged was 68½ per cent.

The Anti-Waster.

He is obsessed with the tremendous waste that goes on all around him. He declares that enough good, nutritious food is flung into the rubbish bins in Brisbane every day to feed all the unemployed in the State. "We are a recklessly wasteful people," he says. "Look at that high-powered car, slipping by there, with only the flapper driver. The power that could easily pull a ton is wasted in carrying a six-stone flapper. How much land could that extra power, if usefully employed, plough up in a day? A big able-bodied man served me with a necktie this morning, and I saw a little sickly fellow down on the wharf tugging at an outsize truck. No organisation of mechanical or human forces anywhere! The whole universe seems to be run on the same wasteful lines. Have you ever considered the enormous amount of solar energy released by the sun every day, and how infinitesimal a portion of it is absorbed by the planets—the rest wasted in space? And yet they talk about the conservation of energy!"—"The Professional Officer."

The Moral Code of "Woodbine Willie."

The Dean of Canterbury ("Dick" Sheppard), writing of his friendship with "Woodbine Willie" (the Rev. G. A. Studdert-Kennedy), says:—

"There has never been anyone in my life who at all resembled him. To me the outstanding qualities which made his friendship so lovely were his deep love of humanity, his intense sympathy and generosity, and his magnetic humour and wit."

In a letter that "Woodbine Willie" sent to his wife while serving in France as to the training of his little son, it is written:—

"1. Make him a sportsman. Encourage him to play games and always to play the game.

"2. Teach him to despise cowardice and never to be afraid of anything or anyone save God.

"3. Teach him as soon as you can what his body is for, about his powers of procreation, and about the necessity of cleanliness in body and mind.

"4. Teach him to tell you everything about himself, and specially everything of that sort.

"5. Teach him that being a gentleman means using your life to serve and help your fellow men as much as ever you can, and that it is dishonourable to desire only to make money and be comfortable. If he has brains, teach him that he must use them to lead men on to better things, and to teach them a gentleman should choose one of the poorly paid but honourable professions.

"6. Teach him to love and reverence women. Encourage him when young to have plenty of girl friends, and to treat them as comrades and never to play with them and deceive them. Teach him that the man who deceives a woman is a scoundrel and that he must try to live straight.

"7. Last, and most important, about his religion. Teach him to love Jesus Christ as the pattern God-Man. Teach him that and leave him free. Don't force his religion in any way, especially if he has brains. There are bound to be in these coming years very rapid developments in Christian thought; let him go his way, and do not be pained or shocked so long as he keeps his love to Jesus Christ. If he wants to become a priest, let him, but never force him in any way. Only teach him constantly that a gentleman must give, not get, must serve and not be served.

"Guard him from vulgarity and snobbishness, and never let him speak contemptuously of anyone or anything except a coward.

"I think that is all. Kiss him for me and give him my blessing, and when he is old enough tell him my life story as you would tell it, knowing that I tried hard most of the time to do right, and when I sinned I was sorry in my heart, as I am now.

"I don't believe I am going to be killed, but I don't know, and any way I am content, so long as God can comfort you."

Dreams and Realities.

"The only real things in life are the dreams," declared Mr. C. G. Ammon, M.P., Financial Secretary to the Admiralty, in a recent speech. "The men and women who make history are the dreamers. There was hardly anything they enjoyed in their social or everyday lives that had not first of all been seen by the dreamer, who then had to make the practical man realise there was money in the idea. As long as a nation or people keep their eyes on purely practical things, that nation is doomed to certain extinction, whether it be immediate or somewhat delayed."

Can Any of Our Readers Beat This?

Discussing pig matters recently with Mr. Walter Skinner, of Jandowae East, via Jandowae, Queensland, we ascertained that his returns from bacon pigs sold during 1929 equalled £3 per cow; that is to say, the dairy herd in regular use numbered 100 head and the returns from the pigs for the year were £300—equal to £3 per cow—the bulk of the pig food being skim milk plus farm-grown crops, greenstuff, &c. We have not the figures per cow or per pig but just a bare outline of the results, and it would be of interest to hear whether any of our readers have kept records of their returns from pigs. Mr. Skinner keeps four or five sows and a boar and occasionally purchases odd lines of store pigs at times when his own stock is depleted by sales or otherwise, and he is quite satisfied there is good money in pigs if they are handled along correct lines.

To Reduce Costs in Tractor Farming.

Looking back over the past ten years, one must marvel at the tremendous advances made in mechanical transportation. Almost daily we are being thrilled by the spectacular feats of speed and endurance on land and sea and in the air. One wonders where it all will end, and how soon the day will come when the uttermost speed has been attained and machines reach such a stage of perfection that the poor human being, with his many limitations, cannot control them.

There is one unit of transport, however, about which we hear very little. It is not heralded for its feats of speed; neither do we read at length of prolonged endurance tests in which it is featured, but, nevertheless, this machine is wonderful in what it can endure, and remarkable in the speed at which it accomplishes large quantities of everyday work. We are referring to "the Tractor." There is no doubt that during the past few years tremendous strides have been made in the perfection of the modern tractor. Time was when a tractor was a large piece of intricate machinery, cumbersome to handle and expensive to run; to-day, however, it is a machine of remarkable economy and efficiency, and there is no doubt that it is an absolute boon to the farmer. Tractor manufacturers have been constantly improving, with a view to obtaining more and more work at less cost. Weight has been reduced, traction has been wonderfully improved, compressions have been made higher, and every facility for ease of working has been adopted. The result is a machine which takes the place of a team of horses, and does the work quicker, cleaner and cheaper, and can, if need be, work twenty-four hours a day for seven days in the week.

With the increased efficiency of the tractor motor must naturally come increased efficiency in the fuel with which to run it. The farmer to-day is demanding the highest quality kerosene in order that he may enjoy, not only the greatest economy, but the greatest ease of working from his tractor. In the old days, when a tractor was only used for the heavy work of the farm, practically any sort of kerosene "would do"; to-day, however, the tractor is a utility job, and its operations range from the full-power job of pulling a plough through clayey land to the lightest job of cutting chaff. The result is the need of a kerosene which will accomplish both jobs and all those in between with ease, and the farmer is fortunate in having supplies of the "New Cross" kerosene within easy reach at over 500 Shell Company depots throughout Australia. This kerosene is a fuel which not only excels in power and economy, but which can be thoroughly depended on to give excellent idling and starting results under the worst possible weather conditions. To the farmer who is sowing or doing light work, where frequent stops are necessary, this facility of idling is essential, and it is with this important point in view that the "New Cross" was evolved.

Another big advantage of this new fuel is the very small percentage of crank-case dilution which occurs. In the past, the dilution of the crankcase oil by unburnt kerosene fractions has been a cause of constant worry and expense to the tractor owner: this is now practically eliminated.

Dipping Deeper.

"There is nothing like a sip of somebody else's philosophy. The biography of some great man or woman, or a collection of letters or memoirs—are so scandalous—gives just the right incentive to go and do likewise when the holidays are done. 'Contact with great minds,' it is familiarly called, and it has in truth as bracing an effect as a draught of fresh air. It also serves to counteract the false ideas that the novel may have set agoing. Here is something milled from hard experience, not the wild dreams of a romantic. Something rather hard to bite on may prove more welcome than you think on a wet day. Everyone hates the wasted feeling that a wet day in the country brings. Novels only make it the more irksome, and belles lettres are apt to seem a little futile, too. The wet day is often the day for something practical. A book, then, on political economy, bird lore, or ancient history—the subject matters less than its serious treatment—may prove a godsend." —E. F. Osborn, in the "Morning Post."

When Digging Post Holes.

Post holes should be from 22 inches to 24 inches in depth. They should not be made too big, as this involves unnecessary labour both in digging, filling, and ramming; nor will the post have such a firm grip in the ground. The holes should be a little more than large enough to receive the posts comfortably and leave room for the rammer to work to the bottom of the hole.

Dig the full depth straight away; if a little too deep it is easy to put in some loose earth to make the post the right height. Sight the posts from the centre, and fill in and ram the bottom—say, the the first 6 inches—thoroughly. The bottom, and near it, is the place where ramming is most required; as the top is approached less ramming will do. Place earth that remains neatly around the post to allow for subsidence.

Sink post holes, if possible, when the ground is in good condition—not too wet and not too dry. Ground saturated with moisture cannot be well rammed.

Fruit Experiments.

In the heart of Kent, near East Malling, experiments are about to be carried out to improve the transport facilities for fruit, particularly on such long-distance routes as the North Pacific and Australia. A complete model of a ship's hold is being erected by the Cambridge Low Temperature Research Station, which is working in conjunction with the Empire Marketing Board. Although the fruit imports of Great Britain have improved wonderfully lately, and show no signs of decreasing, it is felt that there is far too much wastage in transport, and for some time past big efforts have been made to find improved methods. Most of these have been in the laboratory, where very useful work has been carried out, and a good many valuable discoveries made, but it is now felt that it is high time to try them on a bigger scale, and that it is far cheaper to carry out the work on shore than to fit out the hold of a ship. That can come later, and in the meantime the building at Malling will hold about a hundred tons of fruit. On land, such alterations as may be found to be necessary in the progress of the experiment can be carried out without delay and expense, the installation being sent afloat for a thorough practical trial when something like finality is reached ashore.

Essentials to Happiness.

If you were asked to make a list of the six things you need most for happiness, what would you put down?

Why not make your own list before reading any further? Like every other person in the world, you want to be happy, and doubtless have given more or less thought to the matter.

Dr. William S. Sadler has studied people for twenty years or more, and he says he has found the essentials of a normal happy life to consist pretty much of the following six things:—1, good health; 2, congenial work; 3, discipline or self-control; 4, human companionship; 5, reasonable leisure; 6, religious or spiritual philosophy.

You will notice that he doesn't lay special emphasis on money at all, although some people would place it first. His experience tells him that many people get along happily without any great amount of material wealth. But there are far too many on the poverty line.

People who enjoy good health and who are doing work they love to do in the right way have found heaven for themselves right here on earth.

Equalise the Car Load.

Equal loading is something that is often disregarded with the small light car, especially the four or five seater. When there are three persons in the car, the disposition of the third, supposing the first two are side by side, is important. The driver, naturally, occupies the right side of the front seat. The other passengers, therefore, should be so placed that the greater weight is on the off-side of the car. Thus, a third passenger, if in the back, should sit on the right side. Similarly, with four passengers, the heaviest should be on the off-side.

The camber of the road already draws the car down unduly on the rear springs. This propensity is emphasised and increased if the heavy passenger be seated on the near side. The car is difficult to steer out of the left side of the road and on corners difficulty may be experienced in getting around without much reduction in speed.

Sometimes the heavier load on the near side makes for actual danger. It increases the chance of skidding when the surface is greasy and it prevents recovery. Equal loading should be obtained if possible, and to ensure equal loading on cambered roads, it is desirable to have the greater weight on the off-side of the vehicle, as so much of the driving is on the unlevel left side of the road.

Wheel—Wobble.

One of the most disconcerting faults that can develop in a motor-car is wheel-wobble, a defect usually caused by the vibrations of the road accidentally putting the two front springs in step with their own vibrations. When that occurs, there is an up-and-down see-sawing movement that produces wobble or shimmy, as it is sometimes termed.

Consequently shimmy dampers are sold, which are a kind of shock-absorber, linking either two portions of the steering mechanism, or the steering tie-rod and the front axle.

Some manufacturers have cured this fault of wheel-wobble by shackling their front springs in front, instead of anchoring them on the dumb-irons, so that it is doubtful whether those springs and the steering-rods will set up the same regularity in their vibrations. As a matter of fact, high speed wheel-wobble is very difficult to remedy, as the devices referred to really apply to ordinary low-speed shimmy. Owners of racing cars very often have to take special means to prevent wheel-wobble by putting in a stronger spring on the off-side than that on the near, or else provide entirely independent springing.

The firm of Rolls-Royce for years realised that every axle was prone to develop wheel-wobble, even on the back axle, and always carried an extra leaf or a stiffer spring on the off-side of the chassis, to counteract any possible shimmying effect that might develop with springs of the same flexibility.

Profitable Breeding Sows.

Mr. B. Henwood, of Besters, in South Africa, writing in the "Farmers' Advocate," mentions that one of his pedigreed Large White sows had a litter of twenty-one recently—all alive and healthy. She has now had three litters and is only two years and five months old. Her first litter was one of ten, and she reared them all, her second of fourteen and she reared eleven, and now twenty-one, which makes an average of fifteen per litter. Is this a record, especially taking into consideration her age? She is a big and well-grown sow, and does her litters well. Ever since starting with pigs, I have always bred only from pigs which came from big litters and whose sires were from big litters. If more breeders of pigs, whether pure or crossbreds for bacon, paid more attention to size of litters of their breeding stock pig-breeding would pay better than it does. Mr. Shelton, Senior Instructor in Pig Raising, has given us these other records of large litters:—(1) A Chester White sow farrowed ninety-six pigs in six litters. The last three litters she farrowed eighteen pigs per litter. (2) Twenty-one pigs per litter—breed of sow unknown. (3) Twenty-three pigs per litter—breed of sow unknown. This last sow gave birth to five litters with a total of eight-five pigs. (4) Twenty-five per litter by a Poland-China sow. (5) Mr. D. E. Hollis, Hollisdale, N.S.W., reared a sow (Tamworth-Berkshire Cross) which had six litters, totalling 105 pigs. She farrowed nineteen pigs on the 28th August, 1928. Three of the pigs went to 140 lb. and the litter averaged 130 lb. Then on the 7th January, 1929, this sow farrowed twenty-six pigs, all alive.

Get to Know Your Cows.

A very great advantage derived from keeping milk records, especially if it is done by someone directly interested in the welfare and profit of the herd, is this: Cows are particularly sensitive animals, and the yield of milk is influenced to a great extent by the treatment they receive, both as regards feeding and their general management; therefore anyone who keeps the record has a great opportunity of discovering the cause from which a certain cow fails in her yield of milk, and he is in a position to put the matter right before any harm is done.

The causes of cows falling off in their milk without any apparent reason are many. For instance, a timid cow may be tied up next to a masterful one, or a new man or lad may be employed who is an indifferent milker, or a cow of a nervous temperament may be receiving such rough treatment as will quite account for her milk falling off.

Again, it may be that the food does not suit some individual cow, and this can be remedied by a slight alteration. Each or all of these reasons can be detected very soon by one having to be in the cowshed in order to keep the records, and which possibly might not otherwise be discovered so quickly, if at all, and anyone doing this would find themselves amply repaid at the end of the year.—S.R., in the "Live Stock Journal" (England).

Milling Values of Wheat.

There are various factors which lower the value of wheat from a milling aspect. Among them are the presence of smut, damaged grains, damaged patches, and bleached, sprung, and shot wheat.

Smut.—The fungus disease known as smut, or bunt, has a very serious residual effect on wheat from a milling point of view. Smutty wheat is treated harshly by millers, as it is difficult to handle, and, although certain "smutting" machines will make a fair sample of infected grain, it is at a considerable cost. There is no excuse now for smutty wheat, however, as practically complete control is secured by proper treatment of the seed. The most satisfactory is the dry copper carbonate process.

Damaged Grains.—The presence of these in a sample of wheat reduces the milling value very considerably; they have serious effects on the quality of the flour, causing a bad colour, imparting an objectionable taint, and reducing its keeping qualities. Furthermore, these damaged grains cannot be removed.

The most serious are those that have been heat damaged, but fortunately they are not common under Australian bagged conditions. They are mostly caused by harvesting the wheat while it is unripe, but the majority of growers are sufficiently alive to the necessity of harvesting when the grain is matured, thus largely obviating the danger of this objectionable condition. This trouble is frequently caused by standing bags of wheat in the paddock without placing sufficient logs (and in some cases none at all) for a foundation. If the ground is damp, or if rain should fall the bottoms of the bags become wet and the wheat is spoilt.

Damaged Patches.—These are viewed seriously, and to remove them it frequently occurs that a section of the bag is cut away with the bad grain adhering. This causes the bag to be valueless and is productive of much waste of grain, and is a source of considerable expense, whereas a little care would have saved to the grower the full original value of the wheat.

Bleached, Sprung, and Shot Wheat.—These defects are all caused by excessive external moisture conditions when the grain is just ripening or ripe, and they might be described as three stages of the one complaint—each causing a reduction in value according to the severity of the damage. Such weathering is difficult to control, being largely dependent on climatic conditions. An alleviation may be secured by close attention to the sowing of suitable varieties at the right time, by harvesting as expeditiously as possible when the grain is ready, and by sowing fine type varieties free from grain of a different maturing period, so that all ripens at the one time.

Bleached wheat is recognised by its loss of colour, for it has a pale, anæmic, and lifeless appearance, with an attendant considerable loss in weight.

Sprung wheat is distinguishable by the above symptoms, together with a bloated appearance of the germ, whilst shot wheat is similar, but with the germs sprouted. Each of the three defects is disliked by millers, the wheat being difficult to store for any length of time, and the flour being much reduced in strength.

Breeding Sows—Size of the Litter.

The size of the litter produced by each sow is determined by several factors—heredity, breed, nutrition, physical condition, frequency of breeding, age of sow, and season of the year. Although the mode of inheritance or the ability to produce large litters is not definitely understood, there is little doubt but that the majority of factors governing the number of ova released and developed in vigorous sows are hereditary. Sows bred twice a year do not produce as many pigs per litter as those bred only once, unless they receive special care; but in herds where the physical condition of the sows is kept at a very high level, these differences do not exist. It is sometimes noticed that young sows do not have as many pigs as older sows. Heavy, fat sows do not have as many pigs as sows in moderate condition; neither do very thin, ill-nourished sows.

There is a very close relation between the size of the litter and the normal weight of the pig at birth. If the litter is five or less, individual pigs weigh as much as 3 lb. or better apiece; if it consists of six to eight pigs, the average is usually 2 lb. to 2½ lb.; if the litter consists of ten or more, the average weight is not likely to exceed 1½ lb. to 1¾ lb. per pig.

Clutch Carelessness.

Clutch carelessness probably causes more wear on cars than any other one thing. A clutch let in with sudden force will make the driving wheels turn a little on their tapering axle ends. Looseness at this point actually becomes a safeguard; otherwise pinion and ring gear would have to endure excessive strain.

Universal joints are strained by sudden application of power, especially if they are worn to a point where they are loose.

Sudden acceleration is more apt to strain the clutch and the rest of the drive, although it also frequently loosens the rear wheels from the axles, injures the universal joints, strains the spokes of the wheels, and increases tyre wear.

Clutches are designed for easy operation, and if the engine be speeded beyond the point where the car itself can immediately follow, the clutch plates will slip. This causes them to heat and may permanently damage them. Often when the clutch slips it will heat and expand, resulting in sudden gripping that is damaging to the whole drive mechanism.

The Speedometer—Its Accuracy Affected by Tyre Wear.

The accuracy of motor speedometers is now practically taken for granted, but if actual scientific tests were made it is possible that their recordings would be approximate only. In most instances, however, the speedometer is so nearly accurate that it is of immense value for all ordinary purposes. On the other hand, speedometers may become inaccurate, and generally they err, after long use, on the side of increasing speed reading.

Again, tyre wear will affect the reading. Given a tyre with, at first, a good thick tread, which has worn down considerably, the reading will be rather excessive. If the tread wears half an inch in diameter the car will travel approximately one and a-half inches less for each rotation of the wheel. This will increase the speedometer reading by a small amount. If the owner is in doubt about the accuracy of his speedometer he can easily check it between mile posts. If it is much out, he should have it overhauled and reset. Wear of tyres will affect the mileage register to the same degree as the speed reading.

Kicking the Bucket—Treatment of Nervous Cows.

Beating a cow with a milking stool when she kicks or switches her tail at milking time is sometimes "adding insult to injury," observes the veterinary export of "Hoard's Dairyman." Who is to blame for her fear of the milking act, for it is that which incites rebellion or reflex acts indicative of nervousness It is more the milker than the cow. Considering the exceeding tenderness and sensitiveness of the teats at the first time of "freshening" and the strength and hardness of the hands of the son of toil who does the milk extracting, is it to be wondered at that pain is induced by the act, and that it is never forgotten by the animals? There is a certain number of cows allotted to each milker, and if he doesn't get them stripped in a given length of time he is accounted inefficient. The consequence is that he gets into the habit of hurried, willy-nilly, "come on with your milk" manipulation of the teats

of each animal, heifer and adult cow alike, very different from the process followed by the calf in sucking milk. The teats are squeezed, bruised, pulled and stripped by the man, all of which cause excruciating pain, at first; but after a time the skin of the teats becomes calloused, more or less, and suffering abates or subsides. But the memory of it remains, and is expressed by kicking, stepping back and forth, setting a foot in the pail, switching viciously, or ''holding up'' the milk.

It would be a blessing to every heifer could she be ''broken to milk'' by a woman—gentle, motherly, sympathetic woman. The work certainly should, in every instance, be most carefully, gently, and patiently done. Were that the rule there would be few nervous, kicking, or otherwise fractious and bothersome cows, and there would be a greater yield of milk in the long run.

Recognising the inducing causes of the vices mentioned, prevention should be the order of the day on every dairy farm. It is impossible, in most cases, to cure confirmed vice, like kicking, but it may be temporarily prevented. There is no remedy for the ultra-nervous and sensitive cow or heifer; but some good may be done by more gentle milking, applying unsalted lard, vaseline, or benzoated oxide of zinc ointment to the teats each evening if they are tender or sore, allowing some relished feed to detract attention at milking time, and setting the cow's calf, or possibly some other very young calf, at her head before starting to milk.

There are many ways of stopping the kicking act. Of these may be mentioned buckling a strap around the cow's hind legs, just above her hocks; fastening a surcingle around her body, just in front of the udder, padding it where it crosses the milk veins and tightening it as required; tying the cow's head as high as possible at milking time; laying a heavy weight upon the loins, such as a sack of grain; tying up a fore leg; putting on side-line hopples, such as are used on a horse; and, lastly, disposing of the chronic kicker to the butcher, for fussing with such a beast may not pay.

PLATE 57.—DESTROYED PEAR ON A ROAD NEAR MUNDUBBERA.

Biological control is an important activity of the Prickly-pear Commission. The Commission's policy of a widespread distribution of cactus-destroying insects has been, and is, of ever-increasing assistance to landholders by the control they exercise over the fruiting of pear. The reinfestation of cleared areas from seeds carried by birds and beasts was in the past a factor that made many landholders despair, as they were thus faced by a never-ending expenditure in maintaining their areas free from pear.

The Home and the Garden.

OUR BABIES.

Under this heading a series of short articles by the Medical and Nursing Staff of the Queensland Baby Clinics, dealing with the welfare and care of babies, has been planned in the hope of maintaining their health, increasing their happiness, and decreasing the number of avoidable cases of infant mortality.

The following is taken from a little book published by the National League for Health, Maternity, and Child Welfare of England.

CHARACTER TRAINING.

IT is important to feed and clothe children in the best possible way. But it is much more important to train their characters in the best way.

Why do we especially want to train children well?

(1) To build up in them strong and noble characters.

(2) To make them fit to face life.

Mothers should begin to train their babies as early as possible. No baby is too young to know whether he can manage his mother, or whether his mother can manage him. Teach a baby at once that he will not get all he wants because he cries for it. A little crying will not hurt him, but to give him everything he cries for will hurt him very much. It will make his character weak, undisciplined, self-willed, uncontrolled.

The child's mind grows with his body, and as the one needs right conditions, so does the other, or it will be stunted.

Observe Nature's Methods.

How can we train and educate the mind and thus influence the character? To do this, we should interfere as little as possible with nature's methods. A baby has great power of concentration; he will look steadily at one thing for a long time, he will make a movement over and over again until he can control it. He should be left undisturbed; he should not be spoken to only for the sake of seeing him smile. Excepting during his regular occupations—his meals, sleep, and going out—he should not be disturbed when he is absorbed. When awake in his cot he should be able to see what is going on around him. This will always be enough to occupy him. As he gets older he should be taught to occupy himself, not to want constant attention from his mother. He will be much happier and give less trouble if he can occupy himself, but he will never learn to do it if he is taken up and amused whenever he cries. To help him to gain a habit of self-occupation is to help to educate his mind and character.

A baby's mental business is to learn all he can about the world in which he lives, and he does not like to be interrupted whilst learning. Do not speak to a child unnecessarily when he is absorbed and good.

We learn and grow by trying and succeeding. Therefore, unless it is hurtful to himself or to others, do not prevent a child from doing what he can for himself, thus teaching him self-reliance.

Mistaken Kindness.

One morning a child of two and a-half years came to breakfast. There were many delightful things he wished to do. He would climb on to his high chair, unfold his feeder, and painfully tie the tapes round his neck in front, and then turn the feeder round. He would take a spoon and crack his own egg. But instead of letting him do all these things, and so gradually learn how to do them, a grown-up rushed at him, tied his feeder and broke his egg, and he broke into a howl of disappointment.

Too often, out of mistaken kindness, people thwart a child when he tries, and enjoys trying, to attain his end by himself.

Do not indulge children, it makes them soft and selfish.

Do not nag or be harsh to them. You may make them cowardly and deceitful. Always be gentle, but always be firm.

Let your yes be yes, your no, no. Never shake children or box their ears or frighten them.

Moral education helps children to learn self-control, and remember you want to make them fit to go out into life, where they will need a great deal of self-control, where they will not find everything made easy for them, where they will not be spoit and get everything they want.

Regularity in good habits when children are small, is a very important part of moral education, because through good habits a child learns to make a right choice, to choose the good and refuse the evil.

Let him hear only kind words and pleasant voices. Let that to which he is accustomed be right, that to which he is unaccustomed be wrong. If he is never told to do unreasonable things he will see that obedience to the reasonable actions he is asked to do is right; and he will be more likely to refuse wrong when it comes his way.

The Cultivation of Good Habits.

Some day he will certainly have to choose between right and wrong. He can only choose rightly if he knows the meaning of right-doing. And whilst he is small this knowledge comes through good habits and trust in the kindness of those he loves best. The first time he makes a good choice he shows control over his will.

Therefore teach children from the beginning:—

(1) How to be obedient.
(2) How to be self-controlled.
(3) How to be unselfish.
(4) How to be pure.
(5) How to be truthful.

Teach them to be unselfish by encouraging them to do things for you and for others; by making them think of other people first, not of themselves first. Do not always slave for them, but show them how they can help you. A mother often makes her children selfish by doing everything for them and saving them trouble. That mother is not really a good mother. A good mother thinks chiefly of what is best for her children's characters, not of what is easiest and pleasantest for them.

To cultivate and practise good habits, bodily, mental, and moral, is to build up a great and good character; and the famous old saying bears this out:—

> "Sow an action, you reap a habit.
> Sow a habit, you reap a character."

Therefore teach your children to do right actions over and over again, until the right actions become habits; and the habits are built into a character.

THE ROSE.

"The rose is the national flower of England, and, supreme as it is among flowers, it feeds our pride in our country and in our selves as no other flower. Flowers quicken the sense of beauty so greatly that the right love of them is almost one with the sense of romance, and for the romance that lies in the extravagance of beauty no flower will bear comparison with the rose. Few types of women, even, will sustain that comparison, although there are many types of roses. The rose bursts upon us in the full pride of the summer, and is one with it, and is almost the essence of it. After it the summer has nothing further to reveal, for the gold of autumn is but decay, and even the carnation that might hold its own with any other flower, though it challenges the rose, and vies with it in every feature of scent and colour, equals it in none, and is by every single one of its charms sealed the rose's vassal. The rose, too, is among flowers the only fit emblem of life."—From "Samuel Langford, Unusual Criticisms," edited by Mr. Neville Cardus.

Plate 58.—Mrs. Irene Longman, M.L.A., Queensland's First Woman Legislator.

Mrs. Longman, who represents Bulimba in the State Parliament, is prominent in every progressive movement for the welfare of Australian women and children, and is interested particularly in the Country Women's Association and kindred bodies having for their object the recognition of the value of women's influence in our national industries and in our great work of nation building.

THE FIRST NEED.

"At the moment there seem no sort of doubt that the first need of the country is houses," writes Dr. Alington, headmaster of Eton, in the "Evening Standard"; "without decent housing it is a waste of time to talk of health, education, or wages, for the most elaborate schemes for looking after young people's physical or intellectual condition must fail if boys or girls have no decent houses to go to, and high wages are no real attraction to a decent father of a family if they do not mean that he can give his wife and children a proper home to live in. Surely the function of the church is clear; it should devote itself, in season and out of season, to declaring that it is the duty of every Christian man or woman to secure that the people of this country are decently housed, and that they have no right to any peace of mind until, at least in their own particular district, that result is secured. Can anyone doubt that if the church had concentrated on this elementary truth ever since the war the conditions to-day would be very different from what they are?"

MARKET GARDENING.

RADISHES.

These may be sown throughout the year, choosing showery, genial weather.

Sow thinly in rows. Succession sowings may be made every three or four weeks. Liberal waterings must be given during dry weather, as rapid growth is necessary in order to obtain crisp and good-flavoured roots. A light rich soil, with moist and open situation, in cool climates is recommended; but in hotter and drier districts a somewhat shady suitation is desirable. Radishes should be used as soon as large enough, as when old they become soft and tough.

Varieties recommended are—Red Turnip; Scarlet Turnip, white tipped; French Breakfast; Long Scarlet.

RHUBARB.

Rhubarb requires a rich, deep, and well-drained soil, and may be propagated from seed or by division of the roots—preferably the former. Seed should be sown in early spring, either in drills 3 feet apart or in a seed-bed. That sown in drills can be thinned out to 15 inches apart, leaving the strongest plants. A heavy mulching of stable manure and copious watering, if the weather be dry, are necessary to keep the plant in rapid growth.

Being a gross feeder, liberal applications of liquid manure can be made.

All weed-growths should be kept in check, and any plants showing signs of running to seed-heads should have these cut back at the first signs of forming. Where the plant is treated as an annual, all the leaves may be gathered as soon as large enough, but where its perennial use is desired, care should be taken to leave sufficient leaves for development of the plant.

Variety recommended—Victoria.

SPINACH.

Of the two varieties of spinach (the round and the prickly) grown for market, the prickly is the more hardy. For this reason, the latter is generally sown for the winter, and the round for summer crops.

The ground for spinach must be worked deep, and, as quick growth is necessary, the soil cannot be too rich. Sow the seeds in rows about 1 foot apart (some prefer the rows 2 feet apart). When the young plants have made four or six leaves, thin them out to from 9 to 12 inches apart. While growing, plenty of water is required to bring the crop to perfection, and the ground must be kept free from weeds.

Sow the "prickly" from March to May, and the round in August and September. Guano, lime, and salt are excellent for this crop.

The leaves will be ready for cutting in from 80 to 100 days from sowing.

SWEET CORN.

A vegetable of easy growth and one to which more attention should be given, owing to the fact that maize or corn is the staple grain grown in this State.

The soil required is one which is suited for any form of maize, and the cultivation is practically similar, with the difference that plants may be left closer in the rows.

The cobs should be taken as soon as the grains are fully formed, and before they begin to harden—what is known as the "milk" stage is the correct period. Cobs should be cooked whole, either roasted or boiled, and form a welcome addition to the vegetable diet so necessary in this climate, and where other forms of vegetables are frequently difficult to obtain. Seed may be sown in spring and early summer. The varieties recommended are—Country Gentleman; Stowell's Evergreen.

SWEDE TURNIP.

Although considered a farm crop suited to the needs of stock, swede turnips, when taken at the proper stage, form a welcome addition to the list of vegetables that may be considered as profitable to grow.

Turnips thrive under identical conditions of soil and climate, but swedes can safely be thinned out to greater distances, whilst the distances apart of the drills require to be somewhat greater. Swedes lend themselves to storage where such is desired, but this should be undertaken only where a favourable situation is procurable.

Sow in early autumn. The varieties recommended are—Elephant or Monarch; Champion Purple Top; Laing's Garden Swede.

SWEET POTATO.

The ideal soil for this crop is a sandy one, well supplied with organic matter. In a soil of this character the plants possess almost the hardiness of weeds, and the root develops well, being even in shape and quality.

Light loams, alluvial loams, and scrub soils are also suitable, but the greater amount of clay present the more unsuited is the soil for the growth of sweet potatoes.

Cultivation is similar to that for potatoes, and although often planted on the flat, better results are usually obtained from growing on ridges from 3 feet to 3 feet 6 inches apart.

Where early plants (late July or early August) are required they can be obtained by placing the selected tubers in a hot-bed.

The tubers are laid on the hot-bed and covered with sifted sandy soil and leaf-mould with a proportion of fine cinders mixed through the mass—keep moist but not wet.

The tubers will be induced to sprout with the bottom heat. Cease watering a few days before the time you plant out, so as to toughen and harden off the shoots. When about to plant, gently break the forward shoots from the tubers, and keep them in a bucket with the bottoms immersed in a thin clay puddle.

Plant out to the required distances in the field, taking care that only about an inch of the top of the shoots appear above the surface. The soil must be well firmed around the base of the shoots to encourage them to start into growth. The tubers will throw out a second growth, which can be used for planting out succession crops.

Preference is given by some growers to long cuttings, 18 to 24 inches in length, which are rolled round the hand before planting out.

A point of great importance is to see that the soil is thoroughly compacted about the base of the shoot and more particularly so during dry weather. Subsequent cultivation must be given to keep down weed-growths and conserve moisture.

Plants set out early in October should produce tubers fit for the table by the end of December. The period of growth, however, will be largely determined by the weather and the variety grown.

The mature stage can be determined by cutting one of the potatoes. If the cut surface dries white and does not turn greenish-black around the edges, the potato is fit to eat; if a milky juice exudes, which on exposure to the air turns black, the potato is immature.

During the latter part of its growth the sweet potato largely increases in weight; therefore, where bulk is an important factor, the tubers should be left in the ground as long as possible after they become fit for the table.

If tubers, after digging, are allowed to dry in the sun for a few hours and are then stored in dry sand they will keep good for some time.

Varieties recommended are—Pierson; Big Stem Jersey; Pink; White Maltese; Yellow Spanish.

CABBAGES AND CAULIFLOWERS.

With the sowing season for cabbage and cauliflower at hand, the results of recent variety trials at Bathurst Experiment Farm, New South Wales, will be of interest to growers of these crops.

The best early cauliflower during the past season, reports the "Experimentalist," was Maitland Market, followed by Early Phenomenal, Early Snowwhite, and a strain of Special Giant, in the order named. Maitland Market has proved the best early cauliflower under test to date, and it is intended to take this variety as the standard early variety at this centre.

The best late cauliflower was a strain of Six Months Special Giant, followed by Phenomenal Maincrop and departmental strains of Six Months Special Giant. Six Months Special Giant has proved the most satisfactory main crop variety in tests at this centre, and is well worthy of adoption as the standard main crop variety.

Succession has proved the best main crop cabbage to date at this centre; the local strain this season was far superior to the European strain, while the Departmental strain was somewhat superior to the commercial strain. Succession is of the Drumhead type, and the hearts are generally large and firm. The most satisfactory early variety was Enkhuisen Glory, which is of the Ballhead type: this variety had a very solid heart of medium size and showed excellent keeping qualities in the field, quite satisfactory hearts being harvested in late September. Winningstadt was considered the most satisfactory early to midseason variety after Enkhuisen Glory. It is a medium-sized early variety, with a pronounced pointed heart and the hearts are very solid and keep well in the field.

The best method of raising plants of cabbage and cauliflower is to sow the seed in drills in the seed-bed, allowing about 4 in. between the rows. Plants raised in this manner are usually sturdy, and differ from the lanky plants obtained from beds where the seed has been thickly broadcasted. The seed should be sown thinly, and each ounce of seed should sow a length of about 200 ft. The seed-bed should be about 4 ft. wide, and should allow of half being weeded from each side. A bed large enough to produce plants for one acre when seed is broadcasted would be 20 ft. long and 4 ft. wide. It is always advisable to put in sufficient seed to raise more plants than are actually needed. This allows for loss by pests, faulty germination, and the transplanting of healthy plants only.

The young plants should not be forced in the seed-bed, and should receive plenty of light so that stocky plants will be produced.

Under ordinary conditions plants should be ready for transplanting in six weeks from sowing, during cooler weather conditions taking a little longer. If possible, a dull day should be chosen for this work; should the weather be hot it should be done either early in the morning or late in the afternoon and the plants should be given some protection in the form of light bush or fern covering.

The distance of planting will vary according to the variety used. For smaller varieties of cabbage, 2 ft. 6 in. by 2 ft. is sufficient, and for larger sorts 3 ft. by 2 ft. If the soil is of poor quality the plants should be given more room, and should be planted 3 ft. by 3 ft.

Cauliflower plants should be set 3 ft. by 2 ft. in the case of first earlies, and up to 3 ft. by 3 ft. in the case of late varieties.

PLATE 59.

A measured quarter-acre of prickly-pear in this country in the Charleville district was poisoned at a cost of 17s. 3d.

Orchard Notes for March.

THE COASTAL DISTRICTS.

If the weather is favourable, all orchards, plantations, and vineyards should be cleaned up, and the ground brought into a good state of tilth so as to enable it to retain the necessary moisture for the proper development of trees or plants. As the wet season is frequently followed by dry autumn weather, this attention is important.

Banana plantations must be kept free from weeds, and suckering must be rigorously carried out, as there is no greater cause of injury to a banana plantation than neglect to cultivate. Good strong suckers will give good bunches of good fruit, whereas a lot of weedy overcrowded suckers will only give small bunches of undersized fruit that is hard to dispose of, even at a low price.

Cooler weather may tend to improve the carrying qualities of the fruit, but care must still be taken to see that it is not allowed to become over-developed before it is packed, otherwise it may arrive at its destination in an over-ripe and consequently unsaleable condition. The greatest care should be taken in grading and packing fruit. Only one size of fruit of even quality must be packed. Smaller or inferior fruit must never be packed with good large fruit, but must always be packed separately as required by regulation.

The marketing of the main crop of pineapples, both for canning and the fresh fruit trade, will be completed in the course of the month, and as soon as the fruit is disposed of plantations which are apt to become somewhat dirty during the gathering of the crop must be cleaned up. All weeds must be destroyed, and if blady grass has got hold anywhere it must be eradicated, even though a number of pineapple plants have to be sacrificed, for once a plantation becomes infested with this weed it takes possession and soon kills the crop. In addition to destroying all weed growth, the land should be well worked and brought into a state of thorough tilth.

In the Central and Northern districts, early varieties of the main crop of citrus fruits will ripen towards the end of the month. They will not be fully coloured, but they can be marketed as soon as they have developed sufficient sugar to be palatable; they should not be gathered whilst still sour and green. Citrus fruits of all kinds require the most careful handling, as a bruised fruit is a spoilt fruit, and is very liable to speck or rot. The fungus that causes specking cannot injure any fruit unless the skin is first injured. Fruit with perfect skin will eventually shrivel, but will not speck. Specking or blue mould can therefore be guarded against by the exercise of great care in handling and packing. At the same time, some fruit is always liable to become injured, either by mechanical means, such as thorn pricks, wind action, hail, punctures by sucking insects, fruit flies, the spotted peach moth, or gnawing insects injuring the skin. Any one of these injuries makes it easy for the spores of the fungus to enter the fruit and germinate. All such fruit must therefore be gathered and destroyed, and so minimise the risk of infection. When specked fruit is allowed to lie about in the orchard or to hang on the trees, or when it is left in the packing sheds, it is a constant source of danger, as millions of spores are produced by it. These spores are carried by the wind in every direction, and are ready to establish themselves whenever they come in contact with any fruit into which they can penetrate. Specking is accountable for a large percentage of loss frequently experienced in sending citrus fruits to the Southern States, especially early in the season, and as it can be largely prevented by the exercise of necessary care and attention, growers are urged not to neglect these important measures.

Fruit must be carefully graded for size and colour, and only one size of fruit of one quality should be packed in one case. The flat bushel-case (long packer) commonly used for citrus fruits does not lend itself to up-to-date methods of grading and packing, and we have yet to find a better case than the American orange case recommended by the writer when he came to this country from California in 1892, and which has again proved its superiority in the recent shipments of oranges from the Southern States to England. Failing this case, a bushel-case suggested by the New South Wales Department of Agriculture is, in the writer's opinion, the most suitable for citrus fruits, and were it adopted it would be a simple matter to standardise the grades of our citrus fruit, as has been done in respect to apples packed in the standard bushel-case used generally for apples throughout the Commonwealth. The inside measurements of the case suggested are 18 in. long, 11¾ in. wide, and 10½ in. deep. This case has a capacity of 2,200 cubic inches, but is not included in the schedule of the regulations under "*The Fruit Cases Acts*, 1912-1922." The half-bushel case, No. 6 of the Schedule above referred to, is 10 in. by 11¾ in. by 5¼ in. inside measurements with a capacity of 1,100 cubic inches. The case should

be suitable for oranges and the half-case for mandarins. No matter which case is used, the fruit must be sweated for seven days before it is sent to the Southern markets, in order to determine what fruit has been attacked by fruit fly, and also to enable bruised or injured fruit liable to speck to be removed prior to despatch.

Fruit fly must be systematically fought in all orchards, for if this important work is neglected there is always a very great risk of this pest causing serious loss to citrus growers.

The spotted peach moth frequently causes serious loss, especially in the case of navels. It can be treated in a similar manner to the codlin moth of pip fruit, by spraying with arsenate of lead, but an even better remedy is not to grow any corn or other crop that harbours this pest in or near the orchard. Large sucking-moths also damage the ripening fruit. They are easily attracted by very ripe bananas or by a water-melon cut in pieces, and can be caught or destroyed by a flare or torch when feeding on these trap fruits. If this method of destruction is followed up for a few nights, the moth will soon be thinned out.

Strawberry planting can be continued during the month, and the advice given in last month's notes still holds good. Remember that no crop gives a better return for extra care and attention in the preparation of the land and for generous manuring than the strawberry.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

The advice given in these notes for the last few months regarding the handling, grading, and packing of fruit should still be carefully followed. The latter varieties of apples and other fruits are much better keepers than earlier-ripening sorts, and as they can be sent to comparatively distant markets, the necessity for very careful grading and packing is, if anything, greater than it is in the case of fruit sent to nearby markets for immediate consumption. Instruction in the most up-to-date methods of grading and packing fruit has been published by the Department, which advice and instruction should enable the growers in that district to market their produce in a much more attractive form.

The same care is necessary in the packing of grapes, and it is pleasing to note that some growers are packing their fruit very well. Those who are not so expert cannot do better than follow the methods of the most successful packers.

As soon as the crop of fruit has been disposed of, the orchard should be cleaned up, and the land worked. If this is done, many of the fruit-fly pupæ that are in the soil will be exposed to destruction in large numbers by birds, or by ants and other insects. If the ground is not worked and is covered with weed growth, there is little chance of the pupæ being destroyed.

Where citrus trees show signs of requiring water, they should be given an irrigation during the month, but if the fruit is well developed and approaching the ripening stage, it is not advisable to do more than keep the ground in a thorough state of tilth, unless the trees are suffering badly, as too much water is apt to produce a large, puffy fruit of poor quality and a bad shipper. A light irrigation is therefore all that is necessary in this case, especially if the orchard has been given the attention recommended in these notes from month to month.

Farm Notes for March.

Land on which it is intended to plant winter cereals should be in a forward stage of preparation. Sowings of lucerne may be made at the latter end of the month on land which is free from weed growth and has been previously well prepared.

The March-April planting season has much in its favour, not the least of which is that weeds will not make such vigorous growth during the succeeding few months, and, as a consequence, the young lucerne plants will have an excellent opportunity of becoming well established.

Potato crops should be showing above ground, and should be well cultivated to keep the surface soil in good condition; also to destroy any weed growth.

In districts where blight has previously existed, or where there is the slightest possible chance of its appearing, preventive methods should be adopted—i.e., spraying with "Burgundy mixture"—when the plants are a few inches high and have formed the leaves; to be followed by a second, and, if necessary, a third spraying before the flowering stage is reached.

Maize crops which have fully ripened should be picked as soon as possible and the ears stored in well-ventilated corn cribs, or barns. Selected grain which is intended for future seed supplies should be well fumigated for twenty-four hours and subsequently aerated and stored in airtight containers. Weevils are usually very prevalent in the field at this time of the year and do considerable damage to the grain when in the husk.

The following crops for pig feed may be sown:—Mangel, sugar beet, turnips and swedes, rape, field cabbage, and carrots. Owing to the small nature of the seeds, the land should be worked up to a fine tilth before planting, and should contain ample moisture in the surface soil to ensure a good germination. Particular attention should be paid to all weed growth during the early stages of growth of the young plants.

As regular supplies of succulent fodder are essentials of success in dairying operations, consideration should be given to a definite cropping system throughout the autumn and winter, and to the preparation and manuring of the land well in advance of the periods allotted for the successive sowings of seed.

The early planted cotton crops should be now ready for picking. This should not be done while there is any moisture on the bolls, either from showers or dew. Packed cotton showing any trace of dampness should be exposed to the sun for a few hours on tarpaulins, bags, or hessian sheets, before storage in bulk or bagging or baling for ginning. Sowings of prairie grass and *phalaris bulbosa* (Toowoomba canary grass) may be made this month. Both are excellent winter grasses. Prairie grass does particularly well on scrub soil.

Dairymen who have maize crops which were too far advanced to benefit by the recent rains, and which show no promise of returning satisfactory yields of grain, would be well advised to convert these into ensilage to be used for winter feed. This, especially when fed in conjunction with lucerne or cowpea, is a valuable fodder. Where crops of Soudan grass, sorghum, white panicum, Japanese millet, and liberty millet have reached a suitable stage for converting into ensilage, it will be found that this method of conserving them has much to recommend it. Stacking with a framework of poles, and well weighting the fodder, is necessary for best results. All stacks should be protected from rain by topping off with a good covering of bush hay built to a full eave and held in position by means of weighted wires.

SUBSCRIPTIONS TO THE JOURNAL.

Subscribers are reminded that when a cross is placed in the square on the first page of the Journal it is an indication that the term of their subscription ends with the number so marked, and that it is advisable to renew immediately if they desire the retention of their names on our mailing list.

To farmers, graziers, horticulturists, and Schools of Art the annual subscription—one shilling—is merely nominal, and the charge is only imposed to cover the cost of postage. To them, otherwise, it is an absolutely free issue. Members of agricultural and similar societies who are not actively engaged in land pursuits are asked to pay five shillings a year, while the annual subscription charged to the general public is ten shillings.

Farmers particularly are urged to keep their names on our mailing list, for through the Journal they may keep themselves well informed in respect to the activities of the Department, and other matters with which they are directly concerned. Instead of sending just the annual subscription along it is suggested that, when renewing it, they do so for a longer term. For instance, five shillings would keep their names on our subscribers' register for five years. By doing this they would obviously help to reduce clerical labour as well as avoid the inconvenience to themselves of posting annually the very small sum necessary to keep their names on our mailing list.

On another page an order form may be found, and for those whose annual subscription is about due what is wrong with filling it up now and posting it direct to the Under Secretary, Department of Agriculture and Stock?

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY D. EGLINTON, F.R.A.S., AND A. C. EGLINTON.

TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

	February, 1930.		March, 1930.		MOONRISE. Feb., 1930.	MOONRISE. Mar., 1930.
Date.	Rises.	Sets.	Rises.	Sets.	Rises.	Rises.
					a.m.	a.m.
1	5.27	6.41	5.48	6.23	7.10	5 57
2	5.28	6 44	5 48	6.22	8.4	6 50
3	5.29	6.43	5 49	6.21	8.58	7.46
4	5.29	6.43	5.49	6 20	9 51	8 42
5	5.30	6 42	5 50	6.18	10.45	9.40
6	5.31	6.41	5.50	6.17	11.45	10.41
					p.m.	
7	5.31	6.41	5 51	6.16	12.48	11 45
						p.m.
8	5 32	6.40	5.51	6.15	1.51	12.48
9	5.33	6 39	5.52	6 14	2.59	1 51
10	5.34	6.38	5 52	6.13	4.5	2 54
11	5.34	6 38	5.53	6.12	5 9	3.52
12	5.35	6.37	5.54	6.10	6.6	4.43
13	5.36	6 36	5 54	6 9	6.52	5 24
14	5.37	6 36	5 55	6.8	7 33	6 2
15	5.38	6 35	5 56	6.7	8.8	6.36
16	5.38	6.34	5 56	6 6	8.42	7.10
17	5.39	6.34	5.57	6 5	9.15	7.44
18	5.40	6.33	5 57	6 4	9.47	8.18
19	5.40	6.32	5 58	6.3	10.24	8.55
20	5.41	6.32	5.58	6.2	11.3	9.39
21	5.42	6.31	5.58	6.1	11.46	10.27
22	5.43	6.30	5 59	6 0	...	11.17
					a.m.	
23	5 43	6.29	5.59	5 59	12.34	...
						a.m.
24	5.44	6.28	6 0	5.58	1.25	12.11
25	5.45	6.27	6 0	5.56	2.18	1.5
26	5.46	6.26	6.1	5.55	3.11	1.57
27	5.47	6.25	6.1	5.54	4.7	2.54
28	5.48	6.24	6.2	5.52	5.3	3.50
29	...	...	6 2	5.50	...	4.46
30	...	...	6.3	5.48	...	5.40
31	...	...	6.4	5.46	...	6.35

Phases of the Moon, Occultations, &c.

7 Feb.	☾ First Quarter	3 26 a.m.
13 „	○ Full Moon	6 39 p.m.
20 „	☽ Last Quarter	6 44 p.m.
28 „	● New Moon	11 33 p.m.

Perigee, 12th February, at 11 p.m.
Apogee, 25th February, at 10·30 a.m.

On the 6th Venus will be on the far side of its orbit, passing from west to east of the Sun. It will then be invisible, barely coming into view after sunset a month later.

About 2 p.m., on the 8th, the Moon will be passing from west to east of Jupiter on its northern side. This will be a good test for keen eyes, or it may be seen with binoculars.

Mercury, on the 15th, being on its greatest western elongation from the Sun, will rise two hours before it.

On the 21st, Neptune, in Leo, will be in opposition to the Sun. They will be rising as the Sun sets.

On the 23rd, at 10 p.m., the Moon will be passing Saturn when both are a long way below the eastern horizon, as they will not rise until 1·25 a.m. (at Warwick) on the following morning. For other places their rising may be reckoned as 4 hours and 19 minutes before the Sun.

Mercury will rise 1 hour and 26 minutes before the Sun on the 1st, or at 4·1 a.m. at Warwick; on the 14th it will rise two hours before it, or at 3·37 a.m.

Mars will rise 1 hour and 17 minutes before the Sun, or at 4·20 a.m. on the 1st; on the 14th it will rise 1 hour and 19 minutes before it, or at 4·18 a.m.

Jupiter will rise at 2·2 p.m. on the 1st, and at 1·23 p.m. on the 14th.

Saturn will rise 2 hours and 33 minutes before the Sun, or at 2·54 a.m. on the 1st; on the 14th it will rise 3 hours and 23 minutes before it, or at 2·14 a.m.

On the 1st of February the Southern Cross will be upside down before 4 o'clock in the afternoon, and three hours later will be coming into view low down in the south-south-east. It will not be upright until about half-past 3 in the morning at places as far east as Brisbane.

As the Sun will be in Capricornus until the 17th, the zodiacal constellations visible after sunset, from west to east, will be—Aquarius, Pisces, Aries, Taurus, Gemini, and Cancer, the latter reaching the meridian before midnight. By the end of the month Orion will set about midnight.

8 Mar.	☾ First Quarter	2 0 p.m.
15 „	○ Full Moon	4 58 a.m.
22 „	☽ Last Quarter	1 12 p.m.
30 „	● New Moon	3 46 p.m.

Perigee, 13th March, at 6·24 a.m.
Apogee, 25th March, at 3·24 a.m.

One hour before sunrise on the 1st March the interesting sight of the two planets Mercury and Mars, only one Moon's-breadth apart, will be worth looking out for. They will be low down, about 17 degrees south of east.

For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S., add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhat about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

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QUEENSLAND AGRICULTURAL JOURNAL

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Event and Comment.

A Bright Seasonal Outlook.

IMPRESSIONS of his recent official tour of the North were given by the Minister of Agriculture and Stock, Mr. Harry F. Walker, to the Press on his return. The whole of the North, from Capricorn to Cairns and the Atherton Tableland, was enjoying a remarkably fine season, said Mr. Walker, and the condition of the sugar-cane, maize, tobacco and other crops was excellent. The Minister had a strenuous tour with a heavy official programme to get through in the course of a very exacting itinerary in the middle of the monsoonal season. Heavy roads and swollen rivers were a daily experience. At each halting place farmers gathered to meet him and deputations and interviews often kept him engaged until midnight. The warm weather and beneficial rains, he observed, had caused phenomenal crop growth, and, altogether, the seasonal outlook was particularly bright. While in North Queensland the Minister paid a visit to the State Experimental Station at Bartle Frere, near Babinda, where experiments with bananas and other fruits were being carried out.

Mr. Walker was very much struck with the culture of tobacco near Mareeba, and he felt that when this year's crop was harvested in four or five months he should be able to speak with authority on the prospects of tobacco-growing in that area and in North Queensland generally. Experiments at Mareeba were being carried out very exhaustively. No pains were being spared to determine the most suitable variety and the best cultural methods to be adopted in the production of the crop.

The agricultural districts in the Central and Southern Divisions and the pastoral areas in the Western Division all benefited immensely by the recent continuous and generous rains, and, as a consequence, the seasonal outlook over nearly the whole of the State is particularly bright.

The Value of Trees—Dangers of Denudation.

STATEMENTS in a report issued recently by the Victorian Forests Commission are not without interest to Queensland farmers. That serious consequences are to be feared from forest denudation is a point very strongly emphasised in the report which states that the removal of forest cover, which affected otherwise assured

sources of water supply, had created an alarming problem in Victoria. In the Ovens Valley gullies miles long, and in places 30 ft. deep and wide, intersected comparatively level country. The deepening of these gullies meant the steady lowering of the water table and the desiccation of good farm lands. Huge gullies had been torn back into the hill sides. Washaways along the routes of roads and railways were becoming an increasing nuisance. Especially was this so in the north-east of Victoria, where a serious and growing maintenance expense was being forced upon road and rail authorities to cope with the speeding up of erosion by deforestation. On the hill sides of the lower Mitta basin there were unusually deep soil beds. These were slipping from the underlying rock beds, and in this area, in a distance of about 20 miles, approximately 200 landslides were visible. Siltation would become increasingly serious as irrigation works were extended. Deforestation along the catchments should be thoroughly investigated. Denudation as a result of settlement or fire must bring in its train a whole sequence of siltation troubles for the irrigation works, but more especially for the Hume Reservoir scheme. Soundings at Burrinjuck indicated already the progressive effect of silting. It might take many years to assume serious proportions, but the time to take action in controlling deforestation was at present. Equally serious was the problem of soil erosion due to wind. That was daily becoming a more urgent problem in many parts of the Mallee. The result was seen in the sand-drift problem causing roads, railways and fences to be submerged in sand, while fertile flats were also reduced in value. The first measure of protection was found in the reservation of sufficient areas to act as protection forests, for which the Forests Commission was continually pressing.

Agricultural Research—Empire Co-operation.

THE 1927-28 report of the Rothamsted Experimental Station at Harpenden records the fact that more and more workers are arriving from the overseas Dominions to carry on their studies at Rothamsted. None but university graduates are eligible, and most are, or are about to be, on the staffs of Government or other agricultural departments—men who will become leaders in the agricultural communities of their respective countries.

The most important of all these Empire developments has recently been inaugurated. At the Imperial Agricultural Conference of 1927 it was decided to set up in Britain a series of bureaux to act as general clearing houses of information and to promote interchange of ideas and methods between the agricultural experts of the different parts of the Empire.

At the invitation of the proper authorities, the director and other members of the staff have already visited the Sudan, Palestine, Australia, New Zealand, and Canada to discuss agricultural problems and possibilities of co-operation. In addition, visits are being paid to the United States and to European countries to discuss problems and methods with experts there, and generally to improve the equipment of the institution and widen the knowledge and experience of the staff.

The Future of Agriculture.

PROVIDED that farmers follow the lines of scientific production most suited to their localities, and that meteorologists are able to discover more about the weather, a progressive future is predicted for agriculture by Sir John Russell, the noted agriculturist and director of the Rothamsted Experimental Station in England. Some time ago, it will be remembered, Sir John Russell visited Australia and New Zealand and had much to tell us about modern agricultural developments. In the course of a recent article he discusses, among other things, the effect of the extending use of labour-saving machinery on the farm, and science as applied to agriculture. It seems reasonable to expect, he says, that specialisation and the use of labour-saving machinery will continue to increase in agriculture; and the expectation seems so good that a great deal of the scientific work is being shaped in accordance therewith. Specialisation has the advantage that it enables the farmer to become an expert at his job; it facilitates combined action in buying and selling, which in these days of organised business is absolutely essential; and it enables the farmer to utilise the resources of science. For the scientific worker specialisation means close adaption of crops to environment; the scientific problems are those associated with the relationships between plant of nutrients, and climatic conditions. Supply of nutrients is controlled by means of fertilisers. The art of cultivation—now gradually being reduced to a science—allows the control of air supply and to some extent water supply and temperature to the plant root. The reaction of the soil—whether slightly acid, slightly alkaline or neutral—is controlled by additions of lime or sulphur. In dry regions irrigation adds to the water supply, though it also concentrates into streaks and patches the salt which, in arid climates, is distributed

throughout the soil, making the areas barren. All these problems are capable of statement as scientific problems amenable to investigation by the ordinary methods of science. The adaptation of crop to environment is effected not only by changes in environment, but by changes in crop also; plant breeders are continuously bringing in new varieties of crops, and stock breeders are introducing new crosses among breeds of animals, the new forms in each case being more suitable to the surroundings, more acceptable in the markets, more resistant to diseases, or in other ways more acceptable than the old. Further, the scientific worker is gradually achieving some measure of control over plant and animal diseases and pests. Losses from these are always unwelcome, sometimes they are serious.

Finally, attempts are now being made to conquer the weather which, in the past, has dominated the farmers' activities. The constant factor of climate can already in part be overcome; dryness by irrigation; coldness, as in Northern Canada, by breeding varieties of plants requiring less time to complete their maturation. Even the variable factors of weather look as if they may in time be controlled to some extent. Modern statistical analysis as developed at Rothamsted shows the relationship between weather and fertiliser efficiency. If the general character of the season could be predicted, appropriate fertiliser recipes could be given to farmers, enabling them to take full advantage of the good features and to mitigate the bad effects of the harmful ones. Can meteorologists even make this prediction? If so, a great step forward in agriculture can be achieved.

The Need of a Forest Conscience.

COMMENTING on the tardy development of a national forest conscience, a writer in a recent issue of the Melbourne "Leader" expresses the opinion that every hill slope growing trees that holds back the soil, that fights erosion, should be treasured and improved. Every reservation that holds back the bank of a winding stream should be maintained on sound forestry principles. The day may come when the streams have to be straightened out, but always and for ever every bank should be protected from the action of flood waters by a fringe of good timber trees. Every pound of soil that goes down creek or river is so much loss. Good work is being done by the Forestry Commission, but much more is still needed, and the commission should receive the full support of every citizen and Parliament in its endeavours to rectify the mistakes of the past. Seventy years is but a beginning in forestry matters, but the records and results obtained during that period should form a guide to and an excellent basis for the operation of any future forest policy. Facts may be stubborn, but they are a much more lasting foundation for success than individual fads. It has taken the Americans some 260 years to bring their great forests to the verge of destruction, but Australians with the experience of the world before them have taken only a little over ninety years to bring their forests to the same condition of partial ruin. Constant demands are being made to throw open forest reservations for settlement, and bearing in mind the small area of good land now available, and the keen competition for such good land for occupation, it is fairly certain that many of the existing reservations as they are denuded of timber supplies will have to be utilised for settlement, and the proposal to make it compulsory that a certain area of all land under settlement must be devoted to forestry purposes is a wise and justifiable one.

With the development of systematic tree planting economics and æsthetics are both served and all concerned, landholder, school, township, State and nation will, in time, co-operate to secure and maintain such plantings. Parks, playgrounds, and recreational areas are a part of modern life. They could, in many instances, be improved and extended as national parks, and in time become a source of income, and at the same time furnish material for industry.

Every provincial centre or country town should seriously consider the possibilities and potentialities of a municipal timber reserve. It is not sufficient to confine activities to State school plantations. The need of wood for industrial purposes is already apparent, and the co-operation of all factors—town, country, State and nation—will only be effective when all realise to the full the urgent need for systematic forestry development and re-afforestation. One thing, however, is essential to the success of the proposal. The adaptability of the various trees to the various sections of the States should be made available, as well as the uses to which they may be put. Facts concerning what to plant, when to plant, where to plant, and how to plant should be prepared and widely distributed. Accurate information is the basis of successful effort, and the services of such bodies as the Forest League, the Tree Planters' Association, and other similar bodies should be availed of in an effort to arrive at the most suitable trees to plant, not only for each district of the State, but also for future utilitarian purposes.

THE QUEENSLAND SUGAR INDUSTRY.

By H. T. EASTERBY, Director, Bureau of Sugar Experiment Stations.

In this series of articles is incorporated the material for a revision of a Bulletin on the Sugar Industry which Mr. Easterby prepared some years ago. Since then the industry has developed to such a degree, and the conditions have so altered, that a revision has become necessary. At the same time, it is recognised that the sugar industry in Queensland, which supplies 96 per cent. of Australian-grown sugar, is so many-sided and is governed by so many factors that it forms in itself a complicated study of no mean magnitude, and one with which it is impossible to deal completely in much less than a large volume. The industry has also in recent years become bound up closely with both Federal and State policy.

Mr. Easterby has covered his subject thoroughly under several heads, each of which he discusses with all possible brevity while retaining every essential of a very interesting narrative.

In this instalment Mr. Easterby continues the review of the development of the industry in pre-Federation days.—ED.

PART III.

(a) Short History of the Industry prior to Federation.

(Continued.)

The Government of Queensland for the past sixty years or more have naturally been keenly interested in the welfare of the sugar industry, recognising that it was an asset of considerable value, and later on that it was destined to become Queensland's largest agricultural industry, giving employment to thousands and distributing millions in the shape of wages. The interest displayed in the industry is partly reflected in the number of Acts passed for its regulation and betterment.

Before the nineties, the Government of the day imported sugar-cane plants, and propagated canes for distribution in the Botanic Gardens, and from that time on have frequently brought out the best varieties growing in other countries.

In 1893, the Department of Agriculture sent Mr. Ebenezer Cowley—at that time overseer of the State Nursery at Kamerunga—to New Guinea, in order to obtain new kinds of sugar-cane, and he came back with a number, of which Batoe, Chenoma, Oraya, and Kikarea did the best, and were grown for some time. Indeed, Kikarea can still be found in the Logan district.

In August of 1895, Mr. Henry Tryon, Entomologist and Pathologist to the Department of Agriculture, was commissioned to proceed to New Guinea and collect a large number of sugar-cane varieties, which were to be sent to the State Nurseries of Kamerunga and Mackay in Queensland, and also to the Department of Agriculture in New South Wales. Mr. Tryon brought back sixty-six varieties, including the well-known

Plate 60.—Interior of Laboratory, Sugar Experiment Station, Mackay.

"Badila," which is considered to be the best variety ever introduced into Queensland. The sugar industry undoubtedly owes a great debt of gratitude to the Department of Agriculture for this cane, to which successful canegrowing in the North is largely attributable. Seeing that in many of these areas 95 per cent. of the cane grown is of this variety, it is not stretching the point to say that quite a number of growers owe their success as cane farmers to it.

In 1898, the Government decided to establish a Sugar Experiment Station at Mackay, and a laboratory was erected on the grounds of the State Nursery and put under a chemist-in-charge. A strong feeling about this time made it evident that the sugar industry required scientific guidance and advice. Comparisons were made between yields of Queensland and those of Hawaii, and it was felt that an independent inquiry into the industry should be conducted. Representations were made to the Government for the engagement of a suitable expert to report upon the condition of the sugar industry in Queensland, and it was arranged for Dr. Walter Maxwell, at that time Director of the Experiment Station of the Hawaiian Sugar Planters' Association, to visit the colony and report upon its sugar industry.

In January, 1900, Dr. Maxwell presented his report to the Secretary for Agriculture and Stock. He reviewed the climate, geological formation, and soils, and pointed out that soils may be of great natural fertility, but if certain elements were removed they must be restored. He stated that in every district from Cairns to Isis recollections were preserved of the crops that used to be grown, from 70 to 80 and even 100 tons of cane per acre, while at the time of his inspection they had decreased considerably. He dwelt on ratooning, pests, disease, and irrigation. In speaking of the cane grown he said:—

> "It is found that most of the large sugar-growing estates, which were originally in the hands of the large planters, have been cut up into farms and rented or sold to numerous canegrowers, particularly in the case of the areas that are furnishing cane for the Government Central Mills the growing is done by farmers who have taken up and own or occupy those lands. These facts place before us a situation that is almost unique and peculiar to Queensland. In other canegrowing countries the estates are in the hands of extensive owners or controlled by large corporations, which state carries with it the consequence that a minimum number of white men are located on the land. In this colony the ownership or occupancy embraces a vast number of strong, responsible, and progressive white men, who are planted over all the sugar-growing areas. These men furnish the material which puts the mills into operation, and, as the mills depend wholly upon the field, it appears that the future of the sugar industry of the colony is very much in the hands of these numerous and small canegrowers.

"The principle of small ownership and occupancy is right and sound, leading as it does to the dividing of the matters at stake amongst a maximum number of responsible men, it furnishes a broad and safe basis for the industry. Small ownership and occupancy, however, have their peculiar drawbacks and dangers. In the numerous cases of occupancy by men who are renting the land, it has been found that the tenure is extended to farmers almost wholly without conditions. Under such agreement the lands can be cropped and recropped, the fertility reduced year after year and nothing returned to the soil, and the mills depending upon them closed for need of material. Whilst stating that these are the results that can follow and are following such a mode of tenancy, it has to be understood that farmers are not the only causes nor even the chief causes of soil beggaration; in fact the tenancy of the farmers is too recent in many cases to be responsible for the state of the soils, and, moreover, it is known that some large estates have done better since they passed into smaller hands. In the case of farmers who occupy and are working their own freeholds, the conditions are different, but the results may be and are, in many examples, the same. Many of these owners are men who were farmers in other countries, but their experience has not necessarily prepared them for the agriculture of cane. Again, numerous others were the followers of divers trades and crafts, and land work with them is a very recent thing."

The report then went on to deal with the manufacture of sugar.

Dr. Maxwell's recommendations were that the canegrowers and manufacturers' sections should form themselves into one body to be known as "The Sugar Growers and Manufacturers' Association of Queensland," to introduce modern scientific methods of agriculture, and still further improve modes of manufacture; that three Experiment Stations be provided, and a Director be appointed to establish such Stations and engage chemists, &c., examine soils, institute experiments, inspect mills, and advise canegrowers.

The outcome of this report was the introduction and passing of an Act to provide for the establishment and control of Sugar Experiment Stations, known as "*The Sugar Experiment Stations Act of* 1900."

Under this Act Dr. Maxwell was appointed the first Director, and took over the existing Sugar Experiment Station at Mackay. A chemical laboratory for soil, fertiliser, and other analyses was erected at Bundaberg, but the Experiment Stations for the Southern and Northern areas were not established till after the departure of the first Director.

It is rather curious that the heavy yields of cane mentioned as having been obtained in the early days in Dr. Maxwell's report, and even to this day spoken of by old canegrowers as being common on

virgin soils, were not duplicated when the new lands of Babinda, Tully, and South Johnstone were opened up. Certainly, heavy crops were harvested, but little was heard of 80 and 100-ton crops. Were the early pioneers of the sugar industry looking fondly back to their early struggles, and perhaps letting their imaginations have full play, or were these big crops actual realities in the days when the scrubs were plentiful and the land in its pristine condition? Of course, too, it has to be remembered that many of the crops in the Southern areas were from eighteen months to two years old.

The sugar production from 1891 to 1900 varied from 51,219 tons to 163,734 tons. In 1901, there were still some sixty sugar mills in operation.

Wages at this period (1900) were on the low side, although money had much more purchasing power than it has to-day. The common rate of wages for white field labourers, of whom there were not many, was about £1 a week and keep.

Nearly all the cane was cut at that time by Kanaka labour. It was estimated that a "boy" at 2s. 6d. per day often cut and loaded into a dray or wagon 3 tons of cane, at a cost of 10d. per ton, while with portable line the cost was somewhat higher, the average being 1s. 3d. per ton. The cost of cutting by white labour at that time was 3s. 6d. per ton.

The costs of growing cane on forest land and scrub, by white and black labour, have been given in a booklet on the Town and District of Mackay, as under:—

FOREST LAND.

	White Labour. £ s. d.	Polynesian Labour. £ s. d.
*Clearing, quarter cost	1 17 6	1 0 0
Ploughing four times, average ⅜-acre per day	1 14 6	1 12 3
Harrowing and rolling	0 10 2	0 6 3
Planting (cutting, carting, drilling, laying, and covering)	1 2 8	0 14 2
Hoeing three times	1 10 0	0 15 0
Supplying	0 10 0	0 5 0
Cultivation with horse implements	0 13 4	0 9 3
	£7 18 2	£5 1 11

* Only quarter cost against the first crop is here charged.

SCRUB LAND.

	White Labour. £ s. d.	Polynesian Labour. £ s. d.
Brushing and falling	2 0 0	1 0 0
Burning and clearing	2 5 0	1 2 6
Holing	3 10 0	1 15 0
Cutting plants, carting, and planting same	1 5 0	0 10 0
Hoeing three times	3 7 6	1 10 0
	£12 7 6	£5 17 6

Only the cost of labour in connection with field operations is included, such items as supervision and depreciation not being taken into account.

These figures were stated to have been collected very carefully at the time.

At the end of last century it was considered that the sugar industry was not being conducted upon the most economical and advanced lines, and that in many directions it could be improved. At that time the number of small uneconomic and inefficient mills were commencing to disappear, and more attention was beginning to be paid to the problems of manufacture. It was acknowledged that more progress had by that time been made since the days when every planter had his own factory, and when thirty mills in one district were turning out an absurdly low tonnage of sugar. It was, however, recognised that scientific control must enter into sugar making, and the most up-to-date mills began to search for chemists who could give assistance in manufacture. With the practice then coming into being of making raw sugar for the refiner instead of every mill being a law unto itself and searching for a market, the price became more certain, and the manufacturer could ascertain more definitely what he was likely to get for his product. Mechanical labour-saving appliances began to be used, at first with some hesitation, but as time went on and labour began to gradually increase in price, such methods became more widely favoured. It must be remembered that at the beginning of this century 40,000 tons of cane for a single mill was considered a big crop.

Some of the figures of one of the principal mills in the Mackay district for the 1900 season are here given:—

Tons of cane crushed	21,617
Number of growers	73
Tons of sugar manufactured—88 net titre	2,530
Average tons of cane to ton of sugar	8·54
Average cost of cane at the weighbridge	£0 13 8
Average cost of manufacture in mill per ton of sugar ..	£1 2 2
Average cost of manufacture and all expenses to f.o.b.	£7 8 2
Total cost per ton of sugar including maintenance and interest	£8 17 10
Output realised per ton	£9 19 7

We are now approaching the formation of the Australian Commonwealth, which carried with it tremendous changes to the Queensland sugar industry. These will be dealt with in the next sections.

[TO BE CONTINUED.]

USEFUL AND INTERESTING.

A Yerra (Gayndah Line) farmer writes (10th January, 1930):—"I have always found the Journal useful and interesting, and appreciate its earlier arrival."

Bureau of Sugar Experiment Stations.

ENTOMOLOGICAL HINTS TO CANEGROWERS.

By EDMUND JARVIS.

Inspection Before Planting Cane.

Nature's law, that like produces like, is too often overlooked, although in the long run any little trouble or expense that may be incurred by the observance of it will be found to have been well worth while.

The following hints, in connection with the matter of selection of suitable setts for planting, should prove useful to those cane farmers who aim at getting best results.

Damage to Setts by Larvae of Bud Moths.

Firstly, the question of clean healthy buds should always receive attention, as injury to these by small caterpillars of our bud moth (*Opogona glycyphaga*) is very likely to occur in soft varieties of cane like "Clark's Seedling," &c.

Badila also, is freely attacked, the damage, however, being usually confined to the rind. The presence of this cane pest is at once betrayed by the occurrence of short meandering tracks, gnawed by the caterpillar on the surface of the rind close against a node.

Weevil Borer (*Rhabdocnemis obscurus* Boisd.).

The presence of this formidable beetle is revealed by conspicuous holes in the ends of setts, indicating spots where its tunnels have been cut through transversely. Any grower aware of the occurrence of such injury, but still making use of these borer-infested plants, is deliberately courting future trouble and ultimate monetary loss. Only by strict examination of all canes procured from outside plantations, can one hope to keep this weevil borer from obtaining a footing in clean canefields.

Mealy Bug (*Pseudococcus* sp.)

Most farmers are familiar with these soft-bodied semi-globular insects which have the appearance of being dusted with white powder, and are found rather commonly under the older leaf-sheaths of cane. Although at present a minor pest in Queensland, it is not advisable to plant setts harbouring colonies of this mealy bug. Their presence on plants can be determined by removing any loose portions of leaf-sheath that may be adhering to the setts.

Advantages of Intensive Cultivation.

Unfortunately, this interesting subject, although of primary importance to our growers, seldom receives the attention it deserves. The more thorough cultivation the greater likelihood there is of our obtaining maximum results.

It should be remembered that a cane stool is, after all, a living organism, and just as animals respond to generous treatment, so it is with members of the vegetable kingdom.

Frequent cultivation to a depth of from 5 to 8 inches or more, on land of a friable nature, and which is well drained and properly manured, cannot fail to establish ideal conditions for plant growth and healthy development.

In such well cultivated land the fibrous feeding roots of young cane are able to extend some distance into the soil, instead of, as happens in poorly cultivated fields, being forced to grow quite close to the surface; thus permitting, in the former case, a longer period of time in which to disturb the cane grubs, before the stools have grown too high, or the roots taken full possession of the soil between the rows.

CANE PEST COMBAT AND CONTROL.

Mr. E. Jarvis, Entomologist at Meringa, reports as follows on the entomological work carried out at Meringa Experiment Station during the period December, 1929, to January, 1930, to the Director of the Bureau of Sugar Experiment Stations, Mr. H. T. Easterby:—

Interesting Occurrence of Cane Beetles.

On 17th January, notice was received at this station of a serious outbreak of greyback cane beetles on a plantation near Banna. So numerous were these cockchafers over an area of about 70 acres that one or more specimens probably occurred

Photo.: J. H. Buzacott.]

PLATE 61.—YOUNG CANE STOOL OF VARIETY D. 1135, SHOWING LEAVES BADLY EATEN BY GREYBACK COCKCHAFERS (*Lepidoderma albohirtum* Waterh.).

Note these beetles resting on the leaves, near base of stool.

on at least 50 per cent. of the stools. In many cases from twenty to thirty or more were counted on a single plant, while on badly infested acres the leaves were practically destroyed, little more than the midrib remaining. The nature of such damage was peculiar and characteristic, the edges of blades which had been left close against the midrib being nibbled in such manner as to present a scalloped appearance (see accompanying photograph). On young central leaves, however, the blade was often entirely stripped to a distance of from 12 to 18 inches back from the point, leaving merely string-like filaments (the midribs).

Mr. J. H. Buzacott, Assistant Entomologist, who was sent to inspect this assemblage of beetles, was fortunate in securing some unique photographs of injured stools with greybacks resting on same. Some boys who were collecting at the time obtained two and a-half kerosene tins full of beetles from 4 acres of D. 1135 in a few hours, an amount representing about 11,000 female cockchafers. In such cases the common-sense remedial method of destroying as many of the beetles as possible in the immediate vicinity of an outbreak is all that can be done in the way of control, and usually proves effective. The importance of such work is realised when one considers that the above-mentioned two and a-half kerosene tins full of beetles captured at Banna would have produced (presuming half these specimens to have been females) about 326,400 grubs, a number able to completely destroy 6 acres of cane. It appears, therefore, that in such cases of infestation it is quite possible to effect a considerable saving, even by a few hours' collecting. This being so, the value likely to be secured from a well-organised campaign against this cockchafer during the first couple of weeks of the flighting season must surely be apparent to all.

Factors Accountable for Alarming Local Outbreaks of Greyback Cockchafers.

As a general rule greybacks, after emerging either from forest or cane lands, fly at once to the nearest feeding trees, and are seldom found resting upon or eating cane leaves. As a matter of fact, this food plant is anything but a favourite, being seldom eaten unless under compulsion or as a result of prevailing abnormal conditions.

With regard to the recent outbreak at Banna it would seem that these beetles probably emerged from cane land which had been much damaged by grubs last season. Had such infestation been at the rate of, say, five grubs per stool throughout an area of about 50 acres, the beetles escaping from this cane land must have numbered at least 2,000,000.

Owing to the long-continued dry weather experienced they were doubtless much weakened, and may have only just managed to reach the surface. The only food immediately available was found to be cane leaves, so, in order to gain sufficient strength to enable them to fly, they were probably forced to eat the first thing that offered in the way of food. Normally, this species (*Lepidoderma albohirtum* Waterh.), after emerging from the soil, endeavours without delay to reach the nearest feeding trees, amongst the top branches of which mating usually takes place at a height of from 20 to 30 feet from the ground.

In the case under consideration the beetles at Banna, after regaining strength, are likely to leave the cane, and seeing that there are few trees close at hand may travel several miles in search of suitable food, in which case they are not likely to return, but will probably lay eggs in the nearest cane land.

In the event of the Banna outbreak not having arisen locally from grub-infested cane fields, the presence of so vast an assemblage of beetles could be accounted for from the standpoint of migration. As mentioned in previous reports, the invasion of cane land in the early days around the Mulgrave and Highleigh districts was apparently brought about by beetles which had migrated there from extensive breeding grounds. The natural laws governing the movements of certain insects are too complex and varied to deal with here, but it may be mentioned that several species, including our greyback cockchafer, when chancing to multiply exceedingly over restricted areas, generally seek to migrate when possible in order to ensure a wider distribution of eggs, and to establish their grubs or larvæ on different classes of soil, thereby hoping to reduce the percentage of mortality likely to be caused by birds, parasitic insects, and other natural enemies.

The danger which invariably threatens any animal (man included) when happening to become overcrowded, or to increase abnormally, not only sounds a note of warning, but at the same time calls for wider dispersion of the species, as being the simplest and most effective remedy.

We will assume that the greybacks in question had migrated from forest country, and upon reaching green cane lands in the vicinity of Banna decided to come to rest in that locality. Had this happened the source of invasion would probably have originated either on some portion of the forest land reserved for a national park in the

parishes of Sophia and Bellenden Ker, or else on the State Forest Reserve in Cadgarra, lying south-west of Sophia and south of the parish of Grafton. In the former case the line of flight chosen by these beetles would have taken a south-easterly direction over the country lying between the Mulgrave River and the Pyramid Range.

It seems more likely, however, that the breakaway in the present instance would have occurred in the Cadgarra area, in which case the course of flight would probably have skirted the western slopes of the Pyramid Range, thus landing these cockchafers right over the centre of the districts of Banna and Aloomba.

FIELD NOTES.

Extracts from a Report on the Lower Burdekin, made by Mr. Albert P. Gibson, Field Assistant to the Director of Sugar Experiment Stations (Mr. H. T. Easterby), at the end of 1929:—

Canegrowing in the Lower Burdekin district is of a highly interesting nature owing to the fact that cane in these areas is irrigated. Considerable all-round improvements have been made here during the last few years, though much still remains to be done.

Work in the field and mill during the 1929 season proceeded without interruption. The crop in quantity and quality was excellent, and the greater part of it was crushed when it contained its maximum amount of sugar.

The total tons of cane milled at the four factories in this district constituted a district record and is as follows:—

	Tons.
Pioneer	134,789
Inkerman	164,328
Haughton	79,547
Kalamia	179,000
	557,664 tons.

Rainfall.

The average rainfall is about 42 inches per annum, but this is badly distributed. Most of it falls the first three months of the year, and in consequence irrigation is generally required to ensure a payable crop.

Cultivation.

Very often the depth of tilling and ploughing the same depth continuously forms a hard pan. This retards drainage, aeration, and deep rooting.

Drain where possible, plough in trash or legumes, and it is thought the application of molasses would gradually improve the soil texture.

Prepare the soil well before planting; some farmers strive to do this afterwards. The depth of ploughing and the number of ploughings really depends on the soil thickness and its texture; a shallow soil may be deepened and improved by gradually ploughing deeper.

Farmers should get to know their soil types and study cultivation, fertilising, and good disease-free varieties of cane most suitable for them.

Irrigation.

Water suitable for irrigation is generally cheaply and abundantly obtained in this district. The water after reaching the surface is gravitated through round or half round galvanised iron flumes or open earth ditches to the field supply drains, from whence it is delivered through pipes 2 ft. long by 2 in. diameter (placed in the drain banks) to the cane or interspace rows; upwards of sixty of these are sometimes watered at once.

Recommendations.

1. It is of paramount importance to have good drains, and these should be kept grass free. Much valuable time and water and money are saved when these are judiciously made and kept clean.

2. Dry farm newly planted cane as long as practicable. Irrigate the cane row until the foliage covers the bare spaces. By so doing deeper rooting is encouraged.

3. Watering the cane in the interspaces has the tendency to form a greater number of surface roots.

4. Irrigate the ratoons immediately after the trash is burnt and cultivate as soon after as possible.

Major Varieties Grown.

New Guinea 15 (Badila) and B. 208 grown on the better lands. H.Q. 426 and E.K. 28 grown on the poorer lands. B. 208 this year again has done remarkably well. This variety when irrigated shoots at the stem badly after a growth check is experienced.

Pests and Diseases.

Destruction of the crops by pests and diseases is less than in any other Queensland district. Grubs and giant white ants have been responsible for some damage. It is recommended that all dead timber in or surrounding the field affected be removed. The control of this latter pest requires much study, as it is possible that it may find sugar-cane so succulent that it will be preferred to their natural food.

New Crop Prospects.

It was necessary to irrigate most of last year to keep the crop growing, and the increased number of waterings will naturally raise the cost of production. The present crop has had a favourable start and looks promising, though generally it is less advanced than it was this time last year. The area to be harvested for 1930 is said to be greater than last year.

CANE PESTS AND DISEASES.

The Director of the Bureau of Sugar Experiment Stations, Mr. H. T. Easterby, has received the following report for the month ended 12th January, from the Assistant Entomologist at Mackay, Mr. A. N. Burns.

Occurrence of Chrysomelid or Leaf-Eating Beetle (*Rhyparida limbatipennis* Jac.) at Oakenden.

Last month whilst visiting several farms in the Oakenden district with reference to damage caused by grubs of the black stem gouger beetle (*Pentodon australis* Blkb.), attention was drawn to the numerous dead shoots in many of the stools. Large shoots were not affected, but in some stools as many as four or five of the small shoots were quite dead. Opening up the basal portions of some of the partially dead ones revealed the presence of numbers of small, whitish-curved grubs, which, when later bred through at the laboratory, turned out to be the above species. Some of these grubs were also found in the ground around the stools, as well as several pupae.

Nature of Injury.

The young larvae enter the basal portions of the shoots below the ground level and eat out the whole of the interiors for the length of an inch or more; this causes the aerial portions of the shoots to die. One of these grubs is evidently capable of being able to destroy several shoots, because grubs of all sizes were found in shoots which had only been attacked for a short period before inspection. This was evident because only small holes were eaten into the sides of these shoots, and the young grubs were in these holes. In the same stools there were dead shoots with their bases eaten out and quite rotten.

Larva.

Length when fully grown (in curved position) about ¼ inch (7 mm.) Colour, dirty creamy white. Head pale yellowish brown, mandibles black, labrum or upper lip (plate-like between mandibles) grey-black. The first body segment behind the head bears a large yellowish dorsal marking. Legs pale yellowish, faintly tipped brown. If viewed under a magnifying glass the sides of the body will be seen to have a thin row of fine whitish hairs—two or three to each segment.

Pupa.

Length slightly less than ¼ inch (about 6 mm.), pale yellowish white but becoming dark brownish black just before emergence. The head and eyes are the first to darken, and that usually takes place about eight days after the change from larva to pupa. The posterior end of the anal segment carries two brown spines, slightly curved outwards, and fairly widely separated at their bases.

Beetle.

The adult beetle is brownish yellow in colour with the posterior ends of the femors (thigh joints) of the legs darker. The eyes are large and prominent, black. The antennæ or feelers are long, eleven jointed, light brown in colour, and have the last five joints darker than the others. The surface of the thorax and elytra are minutely punctate, the punctations on the elytra forming definite longitudinal rows. On each elytron are two dark-brown streaks and a small dark spot; the longest and more noticeable of the two streaks is nearest the inner edge of each elytron and is situated at about two-thirds from the thorax, the other and shorter streak is near the outer edge of each elytron and is about half way from the thorax. The brown spot is situated on the "shoulder" of each elytron, laterally, and where the slope commences towards the dorsal surface of the elytron. This insect is rounded in appearance but is longer than broad. It measures just less than ¼ inch in length (7 mm.) by almost 2/10-inch in width (4 mm.).

This beetle is regarded as being a minor pest of sugar-cane only, and it is doubtful if the extent of damage caused by it calls for artificial control measures. Plenteous working of young cane is very helpful in keeping down insect enemies of this nature; many are thus exposed to the surface and are therefore destroyed by ants and insectivorous birds. Should, however, a great number of shoots be attacked, the cutting out as low down as possible of those which are just commencing to wither will remove a good many of the grubs. The grubs will have forsaken the dead shoots, therefore it is useless to remove these.

Emergence of Cane Beetles.

Following the welcome rains that commenced on the 28th December, 1929, a general emergence of cane beetles and associated species occurred. It is evident that the long and continued dry spell prior to these rains has been responsible for many beetles perishing in their cells. Even at the time of writing though there has been a total of well over 7 inches of rain, it has not penetrated to a depth of more than about 15 inches in some places. In view of this it is likely that fresh beetles will still be emerging from day to day, so that the complete emergence will be spread over a period of from two to three weeks. Greybacks (*L. albohirtum* Waterh.) are flying freely each evening and large numbers are being collected daily from the feeding trees, especially along the river from Rocklea to Dumbleton (near Mackay). Other receiving centres are also getting large numbers daily.

The flight of frenchi beetles (*L. frenchi* Blkb.) in the vicinity of the Experiment Station is considerably less than it was last year, and the beetles only appeared in appreciable numbers for the first few evenings during the first week of rain. Collectors near the Station reported getting several pounds each evening from fences, shrubs, &c., and in the same areas are now finding it difficult to collect 1 lb. during an evening. This would appear to indicate that the long dry season has accounted for many of these beetles, because last year they were numerous for at least three weeks after the rains commenced.

The numbers of the "Anomala" or small blue-bronze beetle (*A. australasiae* Blkb.), which may be seen at dusk collected on fence posts and lantana and franjipanni flowers, appears to be in about the same force as last year. This species would not probably suffer so much from the effects of the dry spell as other species because it does not pupate very deep, consequently the beetles would have a better chance of escape when the rains came. About a month ago at Peri, 5 miles from Mackay, a small local emergence of these beetles took place after a thunderstorm which yielded about half an inch of rain. No other cane beetles were noted there at that particular time.

The Christmas Beetle (*A. boisduvali* Boisd.) and Allied Christmas Beetle (*A. porosus* Dal.) are fairly plentiful on their feeding trees which are chiefly guava bushes and blue gum trees (*E. tereticornis*). They do not appear, however, to be in such great numbers as they were last season, because trees which were then almost completely defoliated are so far scarcely showing any signs of their ravages. Collectors near the Station report that they are not getting as many of these beetles as they usually do. This, of course, may not apply to all localities around Mackay.

The Golden Beetle (*C. mastersi* Macleay) appear to be in about the same numbers as last year; the writer visited some of its feeding trees (the prickly cork tree, *E. verspati'io*) last week, and the beetles were equally as plentiful as they were there last year, except that last season they appeared fully three weeks earlier, in the middle of December.

The large blue-green beetle (*R. aeneus* Fab.), which is usually fairly plentiful on Moreton Bay Ash trees (*E. tesselaris*), appears to be scarcer this season. Two examples only have so far been collected by the writer whilst collecting beetles, and collectors report that this species is scarce this season.

The green beetle (*C. rayneri* Macleay), usually found fairly freely on Bloodwood trees (*E. corymbosa*), is being collected in numbers from the paper bark tea-trees (*Melaleuca leucadendron*) growing along the river banks. This species was not so plentiful last year as it is at present.

It can therefore be fairly reliably estimated that the beetles' flight in general is not so large as it was last season. In some isolated areas where earlier storms occurred, and, as was the case, the flight may be of usual magnitude, but the above estimation applied chiefly to the country round the Experiment Station and Racecourse mill. Owing to the long dry season a natural check has resulted, but this does not necessarily mean that grubs will be scarce during the coming season.

Mr. R. W. Mungomery, Assistant Entomologist at Bundaberg, has furnished to the Director of Sugar Experiment Stations, Mr. H. T. Easterby, the following notes for publication, these having a bearing on grub damaged farms, which can now be seen in a few parts of the Bundaberg district:—

Notes on Grubs.

Grub damage during the past few months has been of a severe nature, several portions of the Bundaberg district having suffered through these pests. This is, no doubt, due in a large measure to the dry weather which prevailed during early spring, when grubs resumed feeding after a period either of inactivity or of lessened aggressiveness during the winter.

In winter grubs are located at deeper depths in the soil, and after their return to the upper soil levels, they begin feeding on the roots and underground portions of the stool, these serving as sources of food and moisture, both of which are necessary for their development. Consequently the cane, being in an enfeebled condition on account of the dry weather and being deprived of its roots, was doubly handicapped and the stools soon began to wilt, turn yellow, and finally die.

Q. 813 was the variety found to be most affected, and growers are advised not to plant this variety when their farms lie within the zone in which they are likely to suffer grub damage. In all cases it is preferable to substitute a deeper rooting variety, and Black Innis is one which might be grown more extensively since this cane stands up fairly well to a variety of harsh conditions.

When to Plough Out.

Ploughing out grub-infested cane should be done as soon as possible—i.e., during the hot summer months, when grubs are feeding near the surface, and all are within the reach of the plough. Their numbers are considerably lessened by the cutting and crushing effects of the discs, by sun injury, by insectivorous birds, and finally if those remaining be hand picked and destroyed the farm will be rid of a serious potential source of infestation for future years.

If this latter precaution is neglected or the block allowed to remain for some months, the grubs commence to retreat into the deeper subsoil, out of reach of the plough, and there they later change into pupae and beetles, the latter being the stage in which reproduction takes place, and so the vicious cycle commences anew.

Excessive wet conditions and cold weather both tend to send grubs downwards, and the object of the farmer should be to get these grub-eaten blocks cleaned up immediately, otherwise unfavourable weather conditions might prevent this being done.

The Director of the Bureau of Sugar Experiment Stations, Mr. H. T. Easterby, has received the following report, dated 29th January, 1930, *from the Sugar Pathologist, Mr. A. F. Bell:—*

FIJI DISEASE.

Bundaberg District.

A fresh outbreak of this serious cane disease was discovered recently on the properties of six suppliers to the Bingera mill. In each case the infected cane was rogued or ploughed out as soon as the discovery was made, and the fields will be kept under observation by the Pathologist to the Bureau of Sugar Experiment Stations, stationed in the district.

It is well known that a cane plant may contract the disease, but on the other hand, may not show any signs of the disease for some months. For this reason it is possible that the disease exists on other farms but in a stage which could not

be detected by our Pathologist, and the outbreak may be more extensive than is now supposed. All farmers in the Bingera district are warned that they should keep a continuous watch for Fiji disease, and they should be particularly careful if buying cane for plants. The varieties to be suspected are 1900 Seedling, D. 1135, New Guinea 16, and Garvan's Black. Any suspected canes should be reported at once to the Sugar Experiment Station, Bundaberg, or the Director, Bureau of Sugar Experiment Stations, Brisbane.

Moreton District.

Fiji disease was first reported from this district in 1927-28, when it was found on four farms in the Bli Bli area, in the variety H. 227. During recent inspections no sign of the disease could be found on three farms, but on the fourth the owners have neglected to carry out the simple methods of control and the disease has persisted, and is a source of danger to neighbouring farms. Two fresh outbreaks have occurred, involving two farms at Landsborough and four comparatively isolated farms at Coolum, the variety affected being D. 1135. Growers should be on the alert and watch for this disease, and any suspicious symptoms should be reported to the Director, Bureau of Sugar Experiment Stations, Brisbane.

In particular, the varieties D. 1135 and H. 227 should not be planted without a careful inspection.

Symptoms.

The main symptoms are as follows:—

1. Usually, the first symptom is the fan-like appearance of the top caused by the young leaves failing to develop properly and being short and blunt and curled inwards. The margins of these leaves often have a scalded appearance.
2. In the later stages all leaves are affected in this manner, and the stalk bears only a few stiff dwarfed leaves.
3. The short, blunt leaves are a darker green than normal healthy leaves.
4. On the back of these leaves, running along the veins, may be found small light coloured swellings or galls. These generally range from ⅛ to 2 inches in length, and are usually about 1/20-inch wide. It is necessary to find these galls before one can be certain that Fiji disease is present.

Control.

1. In the first instance, care should be taken to plant cane from fields in which the disease has never been observed.
2. Uproot all diseased stools in fields in which the infection is less than, say, 5 per cent.
3. Fields in which more than 5 per cent. of the stools are infected should be ploughed out immediately after harvesting.

An account of the symptoms of the disease, together with photographs, may be found in Bulletin No. 2 of the Division of Pathology of the Bureau of Sugar Experiment Stations, which bulletin is available on application.

Fiji disease is one of the most serious diseases of sugar-cane, and twenty years ago threatened the very existence of the Fijian sugar industry.

THE FARMER AN EDUCATED MAN.

The idea that the farmer should be trained in agriculture, and little or nothing else, is part of the stupidity of the purely vocational conception of education. It might just as well be contended that the plumber should learn nothing but plumbing and the bootmaker nothing but bootmaking. Farmers need a full training of mind and character for their battle, and the relative isolation of their lives makes it especially important that they should have been taught to employ their leisure wisely. The headmaster of Christ's College makes a similar plea for an all-round foundational education for the farmer. More benefit would be derived from learning one basic scientific subject like chemistry really well than by cramming any amount of information, undigested and half-understood, on the subject of soils. But, while it is possible to do more to interest the boy in the land, it is in the main true that, as Mr. Crosse says, the chief obstacle to boys going on the land is economic. For most boys the prospects seem unpromising, and no amount of educational "bias" will overcome such reluctance.—"Auckland Star."

FIELD NOTES ON THE BANANA FRUIT-EATING CATERPILLAR (*Tiracola plagiata* Walk.).

BY J. A. WEDDELL, Assistant Entomologist.

Introductory.

During the month of March, 1927, considerable damage to cultivated bananas, maize, and other crops was occasioned by the larvae of a noctuid moth in the Southern Coastal districts of Queensland from Brisbane to Gympie, the badly affected areas including also the Kilcoy district, portion of the Brisbane Valley line, the Dayboro' district, and to a less extent the Kandanga-Amamoor area. As a result of the reports received, the writer was deputed early in March by the Chief Entomologist to investigate the outbreak in the field, and Miss Temperley to take charge in the laboratory of the living material which was collected. The information contained herein is the result of the field observations, and a subsequent article by Miss Temperley will describe the work carried out by her in the laboratory. In Miss Temperley's article will be found the descriptions of the insect's life-cycle stages and information regarding its life-history.

The insect concerned was provisionally identified from the larval characters as being *Tiracola plagiata* Walk., and this identification was subsequently confirmed by Dr. A. Jeffries Turner when specimens reared in the laboratory had reached the imaginal stage.

The attack under consideration was characterised by the fact that the insect was present in widely separated centres and was concentrated to plague dimensions in each locality, generally in and near patches of scrub or areas under weeds. Plantations or farms adjacent to such patches suffered severe damage; in a few of the banana plantations all fruit was damaged, and numbers of banana-growers lost approximately one-third to one-half of the season's crop. Maize and pumpkins particularly, and other crops growing in the affected areas also were badly damaged.

Synonymy.

The moth is now known as *Tiracola plagiata* Walk., but records of its occurrence have been made under the following names which are regarded as synonyms. *Arcilasisa plagiata* Walk., *Agrotis plagifera* Walk., *A. spectabilis* Walk., *A. plagiata* Walk., *A. grandirena* Herr Schäff. In searching the literature it was found that the generic name *Arcilasisa* has also been variously spelt *Arcilasia* and *Arcilisia*.

Previous History of the Insect in Queensland.

The insect has previously been associated with the banana plant as an occasional fruit pest; the records of the Entomological Branch show that it was received from Currumbin (4th June, 1916, and 7th August, 1917), Gympie (17th June, 1919), Montville (29th Oct., 1926), and Buderim (11th November, 1926), with bananas in each case the principal host; also the adult was reared from a caterpillar collected by Mr. Henry Tryon in a Stanthorpe orchard in 1895 or 1896. Tryon[17] also recorded the insect as a leaf-eating caterpillar on mulberry at Brisbane during the Departmental year 1914-1915.

The records further show that the specimens received from Gympie (17th June, 1919) were sent to illustrate an outbreak that was comparable, apparently, in both the amount of damage and the extent of

area affected, with that now under consideration. On that occasion the whole of the Gympie area—Brooloo, Kandanga, Amamoor, Lagoon Pocket, Corella, Chatsworth, and Traveston—was reported to be badly infested by the late Mr. James Mitchell, Assistant Instructor in Fruit Culture. Banana-growers in the area suffered serious losses, and Mr. Mitchell stated that the caterpillars were feeding also on maize, papaws, garden peas, bush shrubs, trees, grass, *Sida retusa*, and pigweed, and he referred to "this destructive pest which is attacking everything green, foliage and fruit."

Mr. J. L. Froggatt has recorded in Departmental Reports the presence of the insect on bananas at Cardwell (September, 1925), Babinda (September, 1925), Innisfail (October, 1926, September and October, 1927), and Byfield (October, 1927).

Occurrence in Other Countries.

The insect was recorded by Hampson[11] as having been collected in Mexico, Cuba, Paraguay, Western China, Sikhim, Bombay, Canara, Ceylon, Singapore, Borneo, Java, New Guinea, Queensland, New South Wales (Sydney), Tahiti, Marquesas (Nuka-Hiva).

A summary is given in Table I. of such host plant records of overseas occurrence as it was possible for the writer to discover. It is interesting to find that Corbett[3] stated that the insect is a pest of cassava, coffee, and rubber in Malaya, and that it migrates from waste lands. Palm[14] also recorded that the insect defoliated "woods" of *Trema amboinensis* and then attacked seed beds and newly-planted tobacco.

De Bussy[4] mentioned in 1915 that the noctuid *Arcilisia plagiata* seemed to have almost disappeared in recent years; it is interesting to note the parallel in Queensland during the intervening years from 1919 to 1927.

In Mededeelingen van het Deli Proefstation[13] it was mentioned that the chalcidid egg parasite, *Trichogramma pretiosa* Riley, had been found infesting the eggs of *Tiracola plagiata* Walk., among other species, which were all spoken of as being well known pests of local crops.

De Jong[5] reported that in one plantation the caterpillars of *Tiracola (Arcilasisa) plagiata* Walk. severely injured the leaves and bark of young *Hevea*, the infestation being due to the normal food-plant, *Ballota*, being completely defoliated.

Cultivated Host Plants in Queensland.

A list of the cultivated plants that were found to be attacked during the 1927 outbreak is given in Table II. Rather full notes of the nature of the injury to three of these—banana, maize, and pumpkin—that suffered most severely are given in following paragraphs. It might, however, be noted here that the fruit as well as the foliage of the tomato was attacked; also that the record of the pear being attacked referred to one small tree.

It must be understood that the three principal hosts probably were so because of the comparatively large area of each. In places the other plants listed in the table were practically defoliated, and it would appear that a large area also of any of them would have been badly attacked had such an area been available.

PLATE 62.—YOUNG LEAVES DAMAGED BY BANANA FRUIT-EATING CATERPILLARS (*Tiracola plagiata* Walk.).

Injury on the Banana.

The larvæ fed on both the foliage and the fruit of the banana, but the damage to the foliage, even where most common, was of little economic importance. The injury was of three types: (*a*) Feeding on the surface of either the leaves or the fruit by the young larvæ; (*b*) eating holes in the leaves by all except the very young larvæ; (*c*) burrowing into the pulp of the fruit by the more mature larvæ.

The damage to the epidermis of the leaves was caused by the young larvæ not more than half an inch in length, and it took place along the edges of the midrib on either the upper or the lower surface. When older the larvæ were able to eat holes in the leaves, and in extreme cases they left very little more than the midribs of young leaves (see Plate 62). Apparently the larvæ either continued to feed on the foliage or crawled by chance to a bunch of fruit to feed there.

The primary, and actually the most extensive, damage that the larvæ caused to the fruit was the eating or eroding of the skin, one larva being able to render unsightly quite a number of the fruit on a bunch; the affected area at first appeared a paler green, but it quickly darkened and became a brown scar (see Plate 63). It was this type of damage that occasioned most of the losses, for, although the other type of damage to the fruit is perhaps more striking, there is the advantage that when a larva burrows through the skin it is satisfied then with the pulp of perhaps only one fruit.

Banana fruit in all stages of development from the time when the bracts lifted right up to the ripening stage was liable to injury to the surface skin by the younger larvæ, but the more mature larvæ burrowed into the pulp only when the fruit was well filled (see Plate 64).

It was particularly noticeable that the larvæ preferred to work in a bright light, for the upper and outward portions of the fingers were those that were first and most severely affected, and many bunches were seen in which the only fingers free from damage were those on the shaded portion of the bunch.

Injury on Maize.

One area of maize, 50 acres in extent, was examined near Kilcoy, and this proved to be fairly uniformly and badly infested by the insect. Larvæ were present on all parts of the plants, and they had damaged both the foliage and the grain. Practically every cob was affected; the silks of the cobs were eaten, and the larvæ had both followed down into the grain, and also apparently eaten through the bracts. In this way, besides the actually damaged grain, there was the possibility of further loss due to rotting consequent on the partial exposure of the developing seed.

Injury on Pumpkin.

Pumpkin vines were growing between the rows of the maize mentioned above. The vines were practically defoliated, and all the fruit was very badly damaged. Inconceivable as it may appear, the larvæ had eaten large patches of the tough rind of the pumpkin, and then had burrowed into the pulp. The least damaged of the pumpkins present had lost approximately one-half of the rind, and in the extreme cases only a heap of frass served to indicate where a fruit had been, even the seeds having been eaten.

PLATE 63.—YOUNG FRUIT SHOWING SKIN EROSION BY BANANA FRUIT-EATING CATERPILLARS (*Tiracola plagiata* Walk.).

Plate 64.—Bunch showing damage by Mature Banana Fruit-eating Caterpillars (*Tiracola plagiata* Walk.).

Other Host Plants in Queensland.

A list is given in Table III. of the weeds, scrub plants, and trees that were found to be attacked by *T. plagiata* during the outbreak under discussion. Of these, firstly the inkweed *Phytolacca octandra,* and secondly the white passionfruit *Passiflora alba* were affected most heavily.

Where the insect occurred in numbers the inkweed was almost completely eaten down, only bare stalks about 12 in. long remained (see Plate 65), and the patches had the appearance of having been "brushed" recently. At one place also a large area of lantana, several acres in extent, had in turn been overgrown by the white passion vines; these vines were found to be almost defoliated.

A glance through this and the previous lists will show that the insect has a surprisingly wide range of food-plants. It includes in its dietary representatives of many natural orders, and among them are plants such as the Scotch thistle, lantana, and the poison peach. The lists serve to show that practically no cultivated plant can be regarded as being safe from attack.

Sites of Oviposition in the Field.

Eggs of the insect were found in the field at Harlin, Brisbane Valley line, in May, 1927. They were found generally singly on the leaves of inkweed, the upper and under surfaces being equally favoured; one case occurred where one egg was superimposed on another. A total of twenty eggs was found, and in the laboratory fourteen of these hatched, but, unfortunately, the larvæ died in the first instar.

A number of very young larvæ of *T. plagiata* were also found feeding on the inkweed, and these were subsequently reared to the adult stage.

It cannot be stated that eggs are not laid on the banana, but from the above and other information it is probable that inkweed is the important primary host.

Migratory Habit of the Caterpillars.

Very little definite information could be obtained regarding the migratory habit of the caterpillars, but they certainly wandered from one plant to another.

One farmer first noticed the insect feeding on some inkweed growing adjacent to his bananas. A few days later he discovered that the caterpillars were infesting several rows of bananas, and the inkweed was by then almost non-existent. Later the caterpillars were found to be spread thickly over a large area of the plantation, and elsewhere were noticeable in smaller numbers, but the bananas nearest to the inkweed remained the most severely infested.

In areas where the insect occurred in numbers caterpillars were found on the ground, on the trunks of trees, on the stems of herbaceous plants, feeding on the foliage, and also moving or resting on the posts and wires of fences.

The caterpillars retained a grip on smooth surfaces by laying down a very fine webbing. The younger larvæ made use of their ability to spin to provide safety lines when they fell or were disturbed; numbers of young larvæ could be seen at times suspended from silk threads a foot or two in length.

PLATE 65.—INKWEED (*Phytolacca octandra*) DAMAGED BY BANANA FRUIT-EATING CATERPILLARS (*Tiracola plagiata* Walk.).

Pupae and Adults in the Field.

In the field the pupæ were invariably encased in earthen cocoons, and were found an inch or two below the surface of the soil, often also partly sheltered by a loose stone, stick, or log. At no time during the investigations was the adult moth seen in the field by the writer.

Natural Control.

In the maize crop abovementioned, a number of ichneumonid wasps were seen flying, and at times they darted towards groups of larvæ either on the ground or on the plants, but no record was made of an actual attempt to parasitise.

However, a number of hymenopterous larvæ and pupæ were found 1 or 2 in. under the soil in the same situations as the pupæ of *T. plagiata,* and in some instances actually encased in the typical earthen cocoon of the moth. These were forwarded to Brisbane, where among other species a number of individuals of *Paniscus testaceous* Grav. reached the adult stage.

A factor of natural control must be responsible for holding the pest in check during those years in which it does not appear in large numbers. Just what this factor is it is at this stage impossible to state, but there is the possibility that egg parasites may be the cause. If then conditions, climatic and other, were to become unsuitable for the egg parasites, the host might be enabled to breed up to pest proportions for the time being.

Artificial Control.

Several possible methods of artificial control suggested themselves, and of these, three methods were given preliminary trials. Unfortunately, these trials could not be followed by the larger and more detailed experiments, such as are necessary before control measures can be recommended with certainty, owing to the rapidity with which the pest manifested itself and then disappeared, and also because of inclement weather during the period. Still, as will be seen below, a certain measure of success was obtained, and the results mentioned will serve as a basis for further experiments when the opportunity offers. The methods of control tried were dusting, baiting, and covering the bunches.

Dusting.

It was found to be practically impossible to dust the foliage effectively on account of the smooth nature of the surface; the dust lay on any fairly horizontal upper surface, but acutely inclined leaves and the under surface of all the foliage retained little poison. Most of the dust cloud, indeed, was carried away and dispersed by the wind, and it must be remembered that a considerable movement of air is usually associated with slopes such as are used for banana cultivation in Southern Queensland. To compensate for all of these adverse factors a heavier dusting was given than should otherwise have been necessary.

The dusting was carried out on a young plantation, the foliage of which was fairly heavily infested considering the size of the plants. Two dusts were used, both being applied with a small hand dust gun.

Eight young plants containing a total of fifty-three caterpillars at the beginning of the experiment were dusted with a mixture of one part of arsenate of lead and five parts of hydrate of lime on 14th March, 1927. On 16th March the plants were examined, and three to five living caterpillars were found on each; the foliage showed fresh damage, both

where the poison dust had fallen and also where the surface appeared clean. No dead caterpillars were found actually on the plants, but a total of sixteen dead and four living caterpillars were found on the ground.

On 17th March the plants were again examined, and from three to five larvæ were still present alive on the plants, eleven dead, and four living caterpillars were found on the ground. (For details see Table V.)

It will be seen that on 17th March thirty-seven caterpillars remained alive and a total of twenty-seven dead had been found, making a total of at least sixty-four caterpillars known to have been in the area during the test. The kill represents 42 per cent., but owing to the migration of the caterpillars this percentage is only very approximate.

Eight young plants containing caterpillars were dusted on 14th March with "Killdust." The subsequent condition of the area was much the same as with the arsenate of lead mixture. The details are given in Table VI., where it will be seen that twenty-one caterpillars were killed out of an accountable population of sixty-one—that is, 34 per cent. Here again the percentage kill is unreliable, for just as fresh caterpillars entered the area during the experiment a number quite probably crawled away elsewhere to die.

Baiting.

A Paris green bait was used for this experiment, made up in the following proportions:—

Paris green	1 lb.
Bran	50 lb.
Molasses or treacle	1 qt.
Juice from	2 oranges.
Water, about	2 gallons.

The Paris green and bran were mixed together dry; the molasses, orange juice and a quantity of the water were then mixed, and stirred into the bran. More water as required was then added to bring the whole to a moist but still loose consistency.

Sufficient bran was obtainable at the time to treat only a few stools, and ten stools were baited on 16th March. These stools, which were in full bearing, were very heavily infested by the pest, there being an estimated total of from sixty to one hundred caterpillars to each stool.

The bran was applied by scattering broadcast, about three handfuls being thrown on the ground surrounding each stool, and one to two handfuls were scattered sharply into the foliage. Distributed in this way the full mixture mentioned above should cover about half an acre.

A number of caterpillars were noticed to be attracted immediately to the bait, leaving the portion of leaf on which they were feeding and moving to pieces of bait that had fallen nearby. Some that were migrating over the ground appeared to deviate in order to feed on chance pieces of bait.

Examination of the patch on 17th March revealed that a large number of larvæ had been killed, estimated at 66 per cent. of the population, and these were present on the ground, in the foliage, and on the bunches. Those on the ground were generally grouped in sheltered spots, and the others were usually hanging limply by their

caudal prolegs from a rough edge such as a torn patch of leaf or the flower end of a fruit. The population of one stool was counted, and the results are given in Table VII.

Half a dozen larvæ from half to full grown were confined in tubes with some of the poison bran bait at 2 p.m. 16th March; at 10 p.m. they were still alive, but less active than at 2 p.m.; by 7.0 a.m. 17th March all were dead.

Covering the Bunches.

This method, strictly speaking, is not a means of control of the insect, but it should prove useful from the point of view of reducing the amount of damage by directly protecting the fruit. The material used was a kind of cheesecloth woven in tubular form, known as "Joycenet," being manufactured by Joyce Bros., Brisbane. It may be purchased in 100-yard lengths and cut up as required, or at a little increased cost it is obtainable cut into lengths with the bottom sewn up, being then known as "Joycenet envelopes."

In using the cloth from a roll it is only necessary to pull the material up over the bunch and to tie it with string around the stalk above and below the fruit, and to cut off the remaining material from below; the fruit in this way is completely encased.

The point needing testing in this particular instance was whether or not the caterpillars would penetrate the material. Two bunches, after being examined to ensure that they were free from caterpillars, were covered with "Joycenet," and in each instance twelve caterpillars, representing as nearly as possible all stages of development, were placed on the outside. They made no attempt to penetrate, and merely walked over the covering. Examination on the following morning revealed the fact that no larvæ remained on one cover, and only one larva was on the other, with two larvæ on the exposed end of the bunch stalk. There were no marks of attempted penetration, and no larvæ were found within the covers.

The cost of the material is not high; it is understood to be about 25s. per 100 yards—i.e., 3d. per yard.

About five minutes was taken to examine and cover each bunch, but with practice this time could be reduced.

	d.
$1\frac{1}{3}$ yards at 3d. per yard	4
5 minutes at 2s. per hour	2
	6d. per bunch.

It seems reasonable to advise that in the event of another outbreak of this pest being noticed in time, the banana-growers should immediately cover at least the "special" and "choice" bunches in the plantations, and possibly extend the operation to include all the bunches that up to that stage have not been attacked.

Provisional Recommendations for Control.

As it seems evident that the outbreak commenced and increased in and near scrub areas, and in particular in the inkweed, it is recommended that a strip of ground be kept clean between the planted areas and nearby scrub, and, of course, that the areas themselves should be cleanly cultivated.

The farmer should examine the scrub at times, paying attention to any inkweed that may be nearby, as he may thus be forewarned against another attack. If the caterpillars should be seen to be at all prevalent, then the farmer should immediately scatter poison bran bait along the cleared strip mentioned, and also over at least several adjacent rows of bananas. Should the caterpillars spread into the farm, it would then be as well to bait the whole area, scattering the bran more thickly near the scrub. Consideration might also be given to the covering of the bunches as described.

The use of dusting is not recommended at this stage owing to the difficulties of application previously mentioned.

Acknowledgements.

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TABLE I.

Overseas Records of Occurrence of *Tiracola plagiata* Walk.

Country.	Host Plant.		Recorded by
	Common Name.	Botanical Name.	
Ceylon	Brinjal or Egg Plant	*Solanum melongena* Linn. ..	Hutson[12]
	Tea	*Camellia theifera* Dyer ..	
	..	*Erythrina lithosperma* Bl. ..	
	Plantain	*Musa* sp.	Department of Agriculture, Ceylon[2]
	Lima Bean ..	*Phaseolus lunatus* Linn. ..	
	French or Kidney Bean	*Phaseolus vulgaris* Linn. ..	
Malaya	Castor Oil ..	*Ricinus communis* Linn. ..	Department of Agriculture, Malaya[6]
	Castor Oil ..	*Ricinus communis* Linn. ..	Gater[8]
	Castor Oil ..	*Ricinus communis* Linn. ..	Susainathan[16]
	Lime	*Citrus Medica* Linn., var. *acida*	
	Tapioca	*Manihot utilissima* Pohl. ..	
	Para-rubber ..	*Hevea brasiliensis* Muell.-Arg.	Gater[8]
	Banana	*Musa* spp.	
	..	*Melastroma polyanthum* ..	
	Cassava	*Manihot* spp.	
	Coffee	*Coffea arabica* Linn. ..	Corbett[3]
	Rubber	*Hevea brasiliensis* Muell.-Arg.	
Dutch East Indies	..	*Ballota* sp.	de Jong[5]
	Tobacco	*Nicotiana* sp.	van Hall[9]
	Tobacco	*Nicotiana* sp.	Palm[14]
	..	*Trema amboinensis*	
India	..	*Emilia* sp.	Hampson[10]
	Tea	*Camellia theifera* Dyer ..	Andrews[1]
Formosa ..	Tea	*Camellia theifera* Dyer ..	Shiraki[15]

TABLE II.

CULTIVATED HOST PLANTS OF *Tiracola plagiata* Walk. IN QUEENSLAND DURING THE 1927 OUTBREAK.

Family.	Genus and Species.	Common Name.
Musaceæ	*Musa* spp.	Banana
Gramineæ	*Zea mais* Linn.	Maize
Cucurbitaceæ	*Cucurbita Pepo* Linn.	Pumpkin
Cucurbitaceæ	*Citrullus vulgaris* Schrad.	Watermelon
Cruciferæ	*Brassica oleracea* Linn.	Cabbage
Cruciferæ	*Brassica oleracea* Linn. var.	Cauliflower
Solanaceæ	*Lycopersicum esculentum* Mill.	Tomato
Solanaceæ	*Physalis peruviana* Linn.	Cape Gooseberry
Passifloraceæ	*Passiflora edulis* Sims.	Passion Fruit
Chenopodiaceæ	*Beta vulgaris* Linn.	Beetroot
Leguminosæ	*Phaseolis vulgaris* Linn.	French Bean
Caricaceæ	*Carica papaya* Linn.	Papaw
Rosaceæ	*Pyrus communis* Linn.	Pear

TABLE III.

WEEDS, SCRUB PLANTS, AND TREES THAT WREE DAMAGED BY *Tiracola plagiata* Walk. IN QUEENSLAND DURING THE 1927 OUTBREAK.

Family.	Genus and Species.	Common Name.
Portulaceæ	*Portulaca oleracea* Linn.	Pigweed
Tiliaceæ	*Sloanea australis* F.v.M.	..
Rhamneæ	*Alphitonia excelsa* Reissek.	Red Ash
Sapindaceæ	*Harpullia pendula* Planch	Tulipwood
Myrtaceæ	*Eucalyptus* sp.	..
Passifloreæ	*Passiflora alba* L. & O.	White Passion Fruit
Cucurbitaceæ	*Bryonia laciniosa* Linn.	Native Bryony
Compositæ	*Bidens pilosa* Linn.	Cobbler's Pegs
Compositæ	*Tagetes glandulifera* Sch.	Stinking Rodger
Compositæ	*Sonchus oleraceus* Linn.	Milk Thistle
Compositæ	*Cnicus lanceolatus* Hoffm.	Scotch Thistle
Solanaceæ	*Solanum nigrum* Linn.	Black Currant
Solanaceæ	*Solanum auriculatum* Ait.	A "Wild Tobacco"
Solanaceæ	*Solanum verbascifolium* Ait.	"Wild Tobacco"
Solanaceæ	*Physalis minima* Linn.	Wild Gooseberry
Solanaceæ	*Nicotiana suaveolens* Lehm.	A "Wild Tobacco"
Verbenaceæ	*Lantana camara* Linn.	Lantana
Amarantaceæ	*Amarantus viridis* Linn.	..
Phytolaccaceæ	*Phytolacca octandra* Linn.	Inkweed
Monimiaceæ	*Kibara macrophylla* Benth.	..
Euphorbiaceæ	*Mallotus philippinensis* Muell.-Arg.	Kamela Tree
Urticaceæ	*Trema aspera* Bl.	Peach-leafed Poison Bush, or Poison Peach
Urticaceæ	*Pseudomorus Brunoniana* Bur.	..
Commelinaceæ	*Pollia macrophylla* Benth.	..
Aroideæ	*Alocasia macrorrhiza* Sch.	Cunjevoi.

TABLE IV.

SYNOPSIS OF HOST-PLANT RECORDS.

	Species.
Recorded Overseas (Table I)	18
Cultivated Host-Plants in Queensland recorded in 1927 (Table II.) ..	13
Other Host-Plants in Queensland recorded in 1927 (Table III.)	25
Cultivated Host-Plants in Queensland previously recorded (not included in Table II.)*	1
Other Host-Plants in Queensland previously recorded (not included in Table III.)§	1
	58
Number of instances in which overlapping occurred between Tables I. and II. (Bananas and French Beans)	2
Total number of Host-Plants recorded	56

* Mulberry, *Morus* sp., fam. Moraceæ, recorded by Tryon.[17]

§ *Sida rhombifolia* Linn. (= *retusa*) fam. Malvaceæ, recorded by Mitchell (see p. 187).

TABLE V.

RESULTS OF DUSTING WITH THE FOLLOWING MIXTURE:—ONE-PART ARSENATE OF LEAD, FIVE-PARTS HYDRATE OF LIME.

Plant.	Number of Caterpillars found on— 14th March, 1927.	16th March, 1927.	17th March, 1927.
A	4	3	3
B	6	5	4
C	8	5	5
D	6	5	5
E	6	4	5
F	9	5	4
G	6	4	4
H	8	4	3
Total alive on Plants	53	35	33
Alive on Ground	*	4	4
Total alive in the Area	..	39	37
Dead on Ground	*	16	11
		27	

* Not observed.

The nearest approximation to the number of larvæ that came under the influence of the test is found by adding the total number alive on 17th March to the total number found dead—i.e., 37 + 27 = 64. Therefore, 27 out of 64 died—i.e., a kill of 42 per cent. This result must be understood to be only very approximate owing to the wandering of the larvæ, both into and away from the experimental area.

TABLE VI.

Results of Dusting with "Killdust."

Plant.	Number of Caterpillars found on— 14th March, 1927.	16th March, 1927.	17th March, 1927.
I	6	5	5
J	6	6	5
K	5	4	3
L	7	4	4
M	6	3	2
N	6	4	3
O	7	6	5
P	8	5	6
Total alive on Plants	51	37	33
Alive on Ground	*	8	7
Total alive in Area	..	45	40
Dead on Ground	*	11	10
		21	

* Not observed.

As in the previous table, the total number of insects under consideration will be taken as the sum of those alive on 17th March, + total found dead—i.e., 40 + 21 = 61. Therefore, 21 died out of 61—i.e., 34 per cent. This result similarly is only very approximate.

TABLE VII.

Larval Population of one Banana Stool Twenty-four Hours after using Paris Green Bran Bait.

Situation.	Alive.	Dead.
On the Ground	5	17
In the Foliage	9	26
On the Fruit	13	3
Totals	27	46
	73	

Forty-six dead from a total of seventy-three represents 63 per cent.

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ECONOMY AND COMMON SENSE.

Any honest doctor, finding that his treatment had harmful instead of beneficial effects, and seeing that his patient became worse instead of better, would not hesitate for a moment to reconsider his original interpretation of symptoms. Neither would he be content merely to maintain strength, or temporarily to heal sores. Rather would he aim at a proper understanding of causes in order that he might, by removing these, pave the way to complete recovery. Similar procedure should be adopted where disease is economic and affects the body politic instead of the body physical, especially so when it prejudicially affects the whole nation.

The economic practitioner has to deal with psychological obsessions which, originating in the individual, frequently flame into mass demands of varying and sometimes questionable utility and possibility. His problem, too, is complicated by the fact that in democratic countries political power lies with those who are easily encouraged to demand but who have little apprehension of the eventual consequences of unwise exaction.

The task of the economist, and for all of us, particularly for those in the trade union movement, is not to waste time in apportioning blame, but to devote time and talents to ascertaining causes and providing remedies which at least replace the wealth expended upon their provision. The practice of giving money for nothing, whether in the form of subsidies or uncovenanted benefits, and of undertaking relief works of which the ultimate value is less than the current expenditure, must leave the community progressively poorer, and involve an eventual poverty which none may contemplate without terror.—Mr. W. A. Appleton, secretary of the General Federation of Trade Unions, in his quarterly report with reference to unemployment.

RURAL LIFE IN OTHER LANDS—X.

By the EDITOR.*

BYWAYS IN BELGIUM.

In our hurried journey through Holland we got back to the province of Limburg and its highly aromatic cheese, and where specialised agriculture is supplanted by secondary industries for which local extensive coal measures are largely drawn upon.

Talking of specialised farming one is reminded that, like France and Denmark, Holland's present position as a primary producing country is due to a serious agricultural crisis that developed at the time when her markets were swamped with grain from newer wheat-growing countries oversea. Facing the facts as they were, the Dutch farmer, like his Danish neighbours, realised that to hold his own in world competition he had to develop a system of intensive culture of special crops, based on modern scientific and technical principles. So he studied his country's possibilities and peculiarities, and shaped his plans accordingly. In some districts he concentrated on grazing—cattle raising, not for the butcher, but for the production of butter and cheese. In other provinces he bent his efforts towards cropping for special products, which involved no particular perishable risk, and for which he had ready markets. He knew, for instance, that the limitations of his land were against successful competition in grain production with farmers on the Australian plain lands or the Canadian prairies. The results of his long-headedness are evident in the stability of his specialised industries to-day. They also supply a moral for farmers in other countries.

A Great People.

In marketing the Dutch farmer is wide awake, and he enjoys the advantage of a highly-organised system. Co-operation is well established. Economic time-saving systems have been evolved, and generally, under their auction sales system, it takes no more than about five minutes to sell a barge load of produce.

Benevolent paternalism is evident in all Government activities, but it is doubtful if the Queensland farmer, with his intenser individualism, would submit to the same degree of regimentation.

Education is widespread, and the social status of the teacher is on a high plane. Rural social life is centred in picturesque villages. In the towns industry is well regulated, and comprehensive laws relating to housing, factory management, and juvenile labour are in force.

Altogether, Holland is a prosperous and progressive country, even if, from an Australian point of view, like other old world lands, she is overweighted with custom, tradition, and puzzling social anachronisms.

The Dutch are a great people, as their history shows, and between Holland and Australia there is a direct relationship—distance-dimmed and shadowy, perhaps, yet quite evident as the map of Australia reveals with physical features, from the Gulf of Carpentaria in the North, Dirk Hartog and Rottnest in the West, and Tasmania in the South, named by early Dutch navigators—Tasman, who discovered Tasmania (he called it Van Diemen's Land) and gave his name to the Tasman Sea, and others of almost equal note.

Back to Belgium.

Returning across the German frontier on the road to Aix-la-Chapelle—the Germans call it Aachen—one was not without regret for not being able to see more of Holland, more of its people, of its systems of rural organisation, its remarkable monuments to human engineering genius and character, its quaint mediæval cities from Groningen down to Maestricht, and its bewildering maze of barge-burdened waterways with their long, straight lines of sheltering poplars "marching against the sky."

Recrossing the Belgian border we were in familiar country again along a road that saw the passing of the invading German army in 1914. Halting at historic Liege with its beautiful bridge, the Pont de Fragnee, its frowning citadel, its old church of St. Martin, and its bisecting ribbon of dull beaten silver—the beautiful river Meuse—we paid tribute to the memory of its heroic defenders.

*In a Radio Address from 4QG.

Taking a roundabout course we passed through Quatre Bras and across the field of Waterloo, with its pyramidal memorial mound—the head of its surmounting lion now turned towards Germany—on the road to Brussels. Flush with the tree-lined road was the farm of La Belle Alliance which you will remember was the centre of the French line on the day of the historic battle. Surveying the peaceful scene from the crest of the mound with the white walls of La Belle Alliance marking the way we had come, we looked across fields of waving grain and furrrowed soil to La Haye Sainte and to other historic landmarks which became immortal on that June day more than a century ago. Recent memories had dissipated all desire to delay too long on battlefields, ancient or modern, but looking out over cultivated fields that once had trembled to the thunder of the guns, down along cobbled roads that once had echoed and re-echoed to the tread of marching armies, and visualising the tragedy of it all, it was hard to resist moralising on the effective artistry of Nature in camouflaging so completely all the ugliness of war.

Where Man has Beaten Nature.

Belgium is another interesting country. In other lands man has been changed by Nature; in Belgium, as in Holland, man has beaten Nature. One's first impression of Belgium in peace time is that of a human meat-ant's nest. No other country in the world, perhaps, is populated so densely, more so even than China. Its 11,000 square miles—the size of a North Australian cattle station—carry just on 8,000,000 of people, and there is scarcely a variety of occupation they do not engage in. About half of the people live by farming and related activities.

Industrial production is equally intensive, and round about Charleroi, which is a coal-mining centre well remembered by men of the A.I.F., one was to see the extraordinary sight of women and girls working as miners on a daily wage. One had got used to women in farm field work, but to see them working coal skips was a new experience.

Charleroi is the centre of a canal system connected directly with the similar systems of Germany, Holland, and Northern France, and it is no uncommon sight to see whole families yoked up in harness towing deeply-laden barges along the waterways.

Dog Power an Economic Factor.

Talking of man power in transport reminds one of the use of dog power in Flanders and neighbouring territories. On the farm dog power is quite an economic factor; and it is utilised to turn separators, operate sewing machines, butter churns, chaff cutters, and other mechanical contrivances.

The principle employed is similar to that of a treadmill. A wheel with treads is mounted on a shafting, from which various gears, belt-driven, connect with the machine to be worked. The dog, which is well-broken to the job, hops into the boxed-in wheel and goes for the lick of his life on a seemingly never-ending Marathon. He remains, of course, in the one spot, his energy turning the wheel, which in turn propels the belt which operates the machine. The dog goes on tirelessly, and one's first thought is of its cruelty. That is not so apparent, however, when you learn that the job is done in shifts. Usually two dogs are employed. Each seems to know to the second when his shift is ended. When that happens the hound starts to yelp and howl, back-pedalling all the time, and then, so to speak, sits down in the breeching, holds a stopwork meeting with himself, checks with his weight the turning of the wheel, and then goes on strike. When the wheel stops he hops out, and his mate takes his place to repeat the same performance until the service is no longer required by the farmer.

Dogs are also used as draught animals, particularly in milk distribution. Sometimes the dog is yoked up in shafts, and sometimes he is harnessed to the axle, the vendor holding the shafts while the dog does the pulling. At times the dogs would feel the call of the wild or enter into the spirit of the chase with a cat as a fleeting objective, and then there would be a scatter of milk and cream cans and much vehement language from the driver. I remember once at a place called Abeele when in the railway yard a mob of dogcarts came in with their loads of milk for delivery. A kindly Digger tossed half a tin of bully beef in amongst the "mongs." The mixup and spilt milk that followed nearly led to international complications, and only the timely arrival of a town picket saved a declaration of another little war on the spot.

These dogs, which are often of no particular ancestry, are very intelligent, and, like the pack camel, know exactly what is a fair thing. If a dog is overloaded or worked beyond his set time he promptly holds a stopwork meeting and "declares his attitude" in his loudest yelps.

Community Service.

A growing practice I noticed among village communities in Belgium—it was an outgrowth of war-time conditions, I believe—was evident in a sort of general community service. When crops were to be harvested all the people of the village turned out. Each crop in turn was harvested by all hands until the whole district produce had been gathered into the barns. No wages were paid, but each farmer supplied food, refreshment, and entertainment to the field workers while they were engaged on his holding. No one was exempt from this community service. When each crop was harvested, all hands moved on to the next, and so on until the harvesting was finished.

The village wood—there is a sort of timber reserve near each centre—is, as a rule, municipally controlled, and each family in the community is apportioned an allotment of the woods sufficient in area to supply its needs for firewood and winter fuelling and otherwise. This illustrates the extent to which, in a very densely peopled country, community service must be organised.

Hard Toil of the Small Farmer.

The whole of the country has been improved out of all recognition by the hard, patient toil of the small farm holder. It has been said that if the test of a country's prosperity is to enable the largest possible population to live on the smallest possible area, then Belgium may justly be considered one of the most prosperous countries of the world.

PLANTING AND DE-SUCKERING BANANAS.

By GEO. WILLIAMS, Director of Fruit Culture.

Among banana-growers generally the mode of planting is by suckers, which are allowed to develop from the original crown, and varying opinions are freely expressed as to the stage which suckers should have reached before removal. The bottle-shaped specimens with a heavy base, and which have not developed foliage or that beyond the initial sword leaves are mostly favoured.

As a result of experiments conducted in different banana-producing countries it has been proved that (as with other plants of this nature) strong suckers from vigorous plants show no advantage over small and what may be called miserable specimens, even those usually called bulbs, nor over plants grown from a single eye or bud removed from a butt with but a small section (1¼-inch diameter and about ¼-inch thickness attached). Planting the large sucker in its natural state will lead to a slightly earlier first bunch being produced if it survives the attack of beetle borer; but instances, if any, are extremely rare where a well developed sucker will produce a bunch equal to that grown on its first follower. Where the central or crown growth is eliminated, two or three plants may be allowed to develop each producing a better bunch than the original. Selecting butts and splitting these into sections according to the number of eyes showing is also much preferable to using suckers as now planted. In each system recommended, the "sets" should be planted beneath at least 4 inches of soil; this eliminates the possibility of the plants being eaten out by weevil borer before they become established. It should be noted that "bits" are planted with the buds or uncut surface facing downward.

From the inception of the plantation in tropical districts where rainfall is plentiful and reliable, careful attention to desuckering can so regulate the season of maturity of the fruit that complaints about transport at this time of the year (when heavy rains and floods are to be expected) may be entirely obviated. The uncertainty of growth owing to the climatic conditions of the Southern and Central districts do not as a rule admit of reasonable anticipation, but no sound reason can be advanced as to why it is not given effect to in the North. It is admitted that the weight of fruit produced in a stool of three stems almost simultaneously will not quite equal that where the production is spread over a lengthy season (this has been noted at Cardwell by Instructor Stephens, also in the Central and Southern districts), though 72 dozen choice fruit were observed on one stool in the Central district, each bunch maturing at the same time. In the Northern district the season may be extended from May to December, and allowing from ten to fourteen months with Cavendish variety, and eleven to fifteen in the Gros Michel (a very wide margin) from the time of sword leaf stage to the cutting of the fruit, no appreciable difference would be present in the weight of the crop. The influence of wet season on transport, also the reduction of attack by fruit fly, will more than repay any little extra trouble which may be entailed. Systematic de-suckering of plantations is considered the most important practice conducive to success in a banana plantation.

STRAWBERRY CULTURE.

The subjoined notes on Strawberry Culture have been supplied by the Fruit Branch, Department of Agriculture and Stock:—

Although the strawberry is commonly considered to be better adapted to the climate of the temperate zones than to that of the semi-tropics, it is, nevertheless, the one berry fruit which can be grown to perfection in this State. Excellent fruit is produced in our Southern coastal districts and even under tropical conditions such as those existing at Townsville, when the plants are grown on alluvial soil and are well irrigated, very good fruit is produced. This shows that the strawberry has a wide range in this State and that it can be grown successfully over the greater portion of our Eastern coastline and the tableland country adjacent thereto, provided there is either an adequate rainfall or, failing that, a supply of water for irrigation.

The commercial cultivation of the strawberry is, however, confined mainly to those districts possessing a regular rainfall, and extends from the Redlands Area in the South to Bundaberg in the North. When grown under suitable conditions in this district, the strawberry has proved itself to be an early and prolific bearer, able to stand a fair amount of hardship, in the shape of dry weather, and to resist the attack of insect and fungus pests to a greater or less extent.

There is a good demand for the fruit, either for immediate consumption in this and the Southern States or for conversion into jam, and, as few crops yield a quicker return, it frequently enables a beginner to make a living whilst more slowly maturing fruit crops are coming into bearing. Many a pioneer fruitgrower has to thank the strawberry for his start, as it enabled him to make a living where he would, in all probability, have failed otherwise, and what applied in the case of our pioneers still holds good with the beginners of to-day.

Our strawberries are of excellent quality and carry well, so that they reach their destination in the Southern States in good order when carefully handled and packed, provided the weather is not excessively warm or the fruit over soft on account of excessive rainfall. The fruit is very suitable for jam, and the product of some of our local factories is not excelled elsewhere in the Commonwealth; further, the demand for strawberry jam exceeds the supply, so much so indeed that, for a considerable period of the year, it is not procurable. There is therefore room for the extension of the industry as the price realised for good strawberry jam in the Commonwealth should enable both producers and manufacturers to obtain a satisfactory return.

Soils for Strawberries.

Given suitable climatic conditions, strawberries will thrive in most soils, but the ideal soil for this fruit is a rich loam of medium texture, well supplied with humus, possessing perfect natural drainage, and capable of retaining moisture during dry spells—and the nearer one can get the soil to this ideal the better the results. Heavy, cold, badly-drained soils are not suitable, but any good loam or sandy loam, whether of scrub or forest origin, can be made to produce good berries if properly treated.

Preparation of the Soil.

There is only one way to prepare soil for strawberry culture, and that is, *thoroughly*. Nothing else will do. In the case of virgin scrub or forest land, which is, as a rule, fairly rich in humus, the land, after it is cleared, should be broken up deeply and brought into a state of as nearly perfect tilth as possible. On virgin soil, except it is of the poorest nature, it is not necessary to apply any manure for the first crop, as there is usually an ample supply of available plant-food and humus present in such soil, but for subsequent crops, or old land, systematic manuring is very important. Old land that is at all deficient in humus should have that deficiency made good, either by the application of a heavy dressing of farmyard or stable manure, such as a load to every 4 perches, or if this cannot be obtained, then by growing a green crop such as cowpeas or other legume which has been well manured with phosphatic and potassic manures and ploughing it in. The green crop so ploughed in should be allowed to rot and, when rotten, the land should be reploughed and worked down fine. If the green crop has received a generous dressing of phosphatic and potassic manure, then there will be no need to apply any further fertilising material to the land, as a complete manuring has been given; but if not, then the soil should be treated as recommended later on.

The surface of the land should be kept as even and level as possible, and, as already stated, it should be worked down fine, so that when the young plants are set out they will take hold of the soil at once and become firmly established.

Planting strawberries on raw land, sour land, or land that has been indifferently prepared, is only courting failure, whereas, when the planting is carried out as advised, there is every chance of success.

Selection of Plants.

Always obtain strong runners from healthy, prolific plants. The first runners next to the parent plants are to be preferred, as they are usually the most vigorous and best rooted, and, further, they come into bearing earlier; but, failing these, any well-rooted, strong, well-grown runners can be used, and although they will not fruit as soon as the first runners they will give a good yield later on, and frequently continue to bear when the earlier fruiting plants have ceased.

Planting.

Having secured suitable plants, trim the straggling roots with a sharp knife; take care not to let them dry out, and plant as shown in the illustrations herewith,

No. 1.

No. 2.

No 3.

No. 4.

which are self-explanatory. Careless planting is responsible for many failures, especially too deep planting, as no strawberry will thrive if its crown is buried under the soil.

The distance at which to set out the plants varies somewhat in different districts, but it is not advisable in any case to overcrowd the plants, but to allow plenty of room. Personally, we favour planting strong plants at from 20 in. to 2 ft. apart each way, so that when planted the land can be worked all round the plant; or if row planting is desired, then the rows should be about 30 in. apart and plants set out at from 15 to 18 in. apart in the row. The illustration of a strawberry garden at Mooloolah, taken some years since, shows the manner of planting adopted by one of the most successful growers of his day, and it will be noted that the plants have plenty of room and are in no way overcrowded.

Cultivation.

Strawberry plants must only be surface-worked whilst growing or bearing fruit. The object is to keep down weed growth and to prevent the surface of the soil caking; but the cultivation must never be so deep that it will injure the roots. The best implement to use is the Planet Junior hand cultivator or similar machine; or, failing that, a good Dutch hoe of any type that may be preferred.

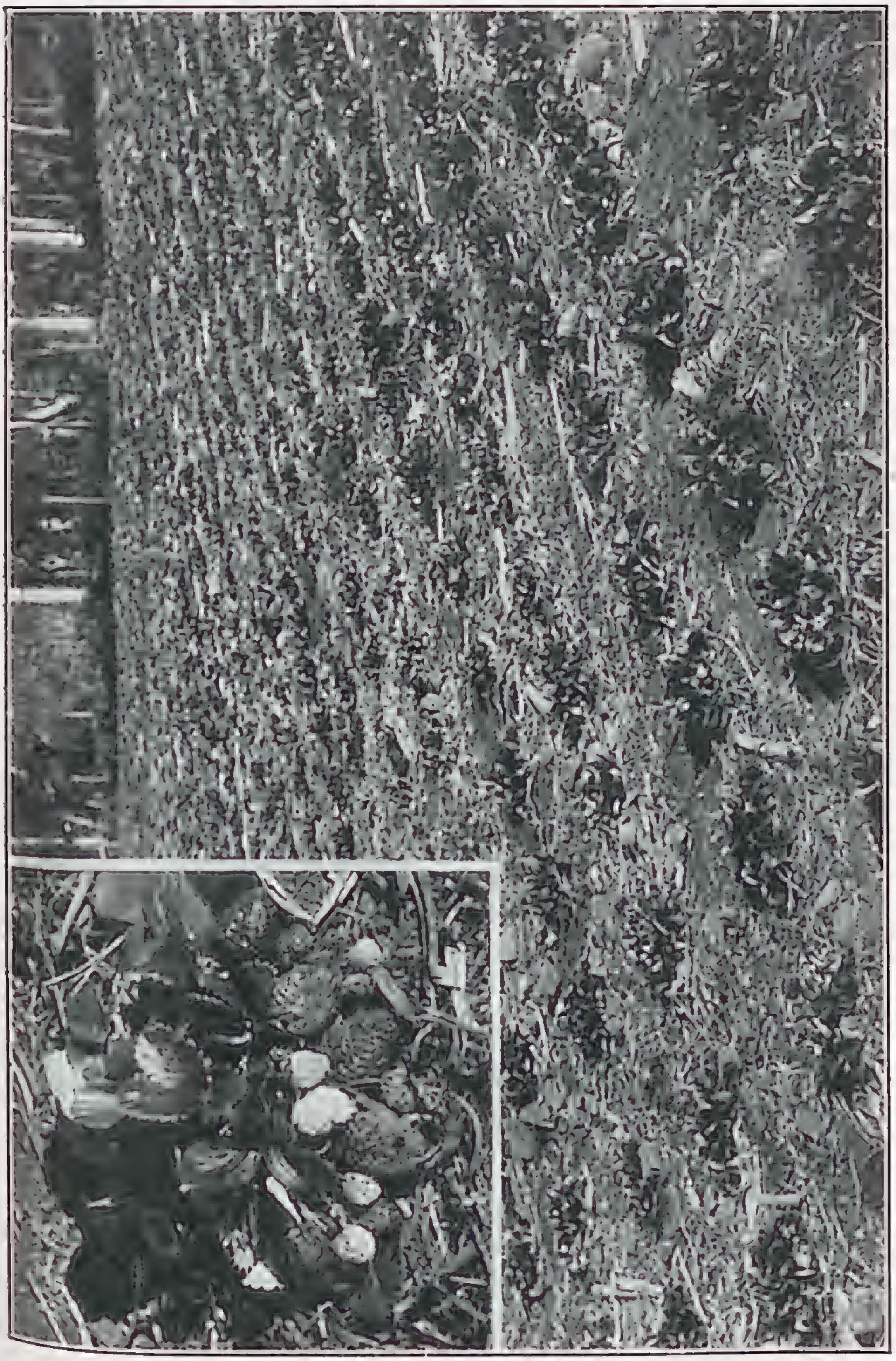

Plate 66.—A Strawberry Garden at Mooloolah.

Weed growth must be kept down and the surface of the soil must not be allowed to become hard and set, as if it does the evaporation of moisture from the soil will be greatly increased, and it will dry out rapidly.

If the plants are to be kept over for a second or third year, then the whole of the runners, other than those required to make good any losses in the original plants, must be removed, and the ground between the original plants must be well broken up and manured in late summer or early autumn, so that the plants will be in good nick for producing a crop of fruit the following season.

If the plants have been badly attacked by leaf blight it is a good plan to cut off all the leaves and burn them prior to working and manuring the land, as numerous fungus spores are destroyed thereby. The burning off is best done by scattering a little loose dry straw over the plants when the leaves have been cut off and have dried, and then setting fire to the lot. A light burning does not injure the plants, but is decidedly beneficial.

Mulching.

Mulching is seldom practised in this State, probably owing to the fact that a really good material for mulching is not readily obtainable, and therefore a light soil mulch produced by the surface working of the soil by means of a Dutch hoe, Planet Junior, or similar hand cultivator is all that is necessary. The use of a paper mulch has, however, much to recommend it, as it would certainly keep down weed growth and tend to maintain even soil conditions. A strip of paper mulch 18 inches wide would be all that is necessary, and the plants should be set through the paper at from 15 to 18 inches apart in the row. A further advantage to be derived by the use of paper mulch is that the fruit would be kept much cleaner as it would not be so liable to be covered with dirt as frequently happens if heavy rain falls or the watering is not very carefully applied.

Irrigation.

Where water is obtainable it should always be available for the plants' use during dry weather, as the ability to maintain an adequate supply of moisture in the soil at all times and thus maintain an even growth will result in larger and better fruit, and a heavy increase in yield. Strawberries pay well for intensive culture, and the money expended in providing a good system of overhead or other method of spray irrigation will be found to be a very profitable investment. A combination of paper mulching and spray irrigation will enable a grower to maintain a regular supply throughout the season of first class table fruit for which there is always a ready market.

Manuring.

The strawberry is a fruit that requires an abundance of readily available plant-food, and one that pays well for systematic and judicious manuring. In the 1924 edition of his pamphlet, "Complete Fertilisers for Farm and Orchard," the Agricultural Chemist to this Department gives the following advice, which it will pay to follow:—

"Some of our coastal country, between the 26th and 28th degrees south latitude, is particularly suitable for strawberry culture, frequently producing quite phenomenal crops. Some of our rich loamy soils found in our coastal scrub lands give the best results. In poorer sandy soils the improvement effected by artificial fertilisers, particularly such containing potash, is very marked, and a light dressing of 5 to 10 tons of stable manure per acre is very beneficial.

"A complete fertiliser for strawberries of the formula 4-8-10 should be used at the rate of 5 to 9 cwt. per acre.

"The following fertiliser mixture may be found useful:—

$$\left.\begin{array}{l}\text{1 to } 1\tfrac{1}{2} \text{ cwt. sulphate of ammonia, or nitrate of soda}\\ \text{3 to 5 cwt. basic or ordinary superphosphate}\\ 1\tfrac{1}{2} \text{ to 2 cwt. sulphate of potash}\end{array}\right\}\text{ per acre;}$$

or,

$$\left.\begin{array}{l}1\tfrac{1}{2} \text{ to 2 cwt. nitrate of soda}\\ \text{1 cwt. fine bonemeal}\\ \text{4 cwt. superphosphate or Nauru phosphate}\\ \text{2 cwt. sulphate of potash}\end{array}\right\}\text{ per acre;}$$

The latter applied by two or three top-dressings, at the rate of 1 cwt. per acre, when fruit is first forming, and thereafter at intervals of two weeks."

Green Crop Manuring.

When dealing with the preparation of the soil, the importance of providing an adequate supply of humus was referred to, and the statement made that where a sufficient quantity of farmyard manure was not available to supply this essential ingredient to the soil, green crop manuring should be used to make good the deficiency. Humus plays a very important part in the composition of soils, and especially so in those devoted to strawberry culture, as its presence in the soil enables it to retain a much larger percentage of moisture than it would do were it deficient in humus. The power to retain moisture is of the greatest importance in a soil devoted to strawberry culture, as the strawberry is a shallow-rooted plant that soon suffers when there is any lack of moisture.

Moisture in the soil also enables the artificial fertilisers applied to become available, as they are of no use whatever to the crop unless their plant-food is capable of being dissolved by the soil moisture, and can thus be obtained therefrom by the roots of plants. When leguminous crops are grown as a green manure they should be manured with a fertiliser containing lime, citrate-soluble phosphoric acid, and potash; such as a mixture of finely-ground island phosphate and a potash salt, used in the proportion of four of the former to one of the latter. No nitrogen need be applied, as the plants will obtain their own from the atmosphere; and when they are ploughed into the soil it will not only be enriched by the plant foods contained in the fertiliser applied to the soil to produce the green crop, but also by the nitrogen that has been produced by the green crop itself; the whole forming a complete fertiliser, as it contains all the essential plant-foods in an available form. Green crop manuring is the cheapest way in which to apply nitrogen to the soil, so that, taking into consideration its value as a supplier of humus, it is of the greatest value when intensive cultivation is intended; and as the strawberry is a crop that demands intensive cultivation, its importance cannot be over-estimated, especially in soils that are deficient in humus. Cowpeas, vetch beans, small Mauritius beans, and the large black Mauritius beans are the best legumes for summer growth and vetches or tares and the grey or partridge field pea for winter.

Marketing.

Fruit for immediate consumption should be gathered whilst still quite firm. It should be carefully handled, graded for size and colour, and packed in boxes or trays containing a single layer of fruit. The use of punnets is not so satisfactory, as the fruit is more likely to be bruised, and it is doubtful if the methods of marketing the fruit in single layers can well be improved upon. Fruit for factory use is stemmed, placed in casks or other suitable receptacles, and forwarded as quickly as possible to the factory. Care in handling, picking, grading, or packing, always pays.

Diseases.

The most serious diseases of the strawberry in this State are those of fungus origin—viz., leaf blight and mildew.

The former can be controlled by the use of Bordeaux or Burgundy mixture applied as a spray, combined with the burning off of affected leaves, as previously mentioned; and the latter can be kept in check by means of precipitated sulphur applied with a light Feeney dust gun provided with an extended tube outlet. The ordinary sulphur generally used in dusting grapes is not efficacious. Insect pests seldom do any very serious injury, but when leaf-eating beetles or other leaf-eating insects are present they can easily be destroyed by spraying with arsenate of lead; or in the case of cut-worms these insects can be kept in check by the use of poisoned baits.

Varieties.

Although most of the standard varieties of strawberries have been grown in Queensland at one time or another, experience has shown that no one variety has proved permanent, but that it has been necessary to either raise new kinds from seed or to introduce them from elsewhere. Varieties producing perfect flowers have proved more profitable than pistillate sorts and are therefore most commonly met with.

After being grown in this State for a few years most varieties become weaker in growth, more liable to disease, and less prolific, so that they have to be discarded. The introduction of new sorts is thus essential, and there is no better way of doing this than by raising local seedlings. Some of the best sorts ever grown in the State have been locally raised seedlings, of which the Aurie, Anetta, and Phenomenal are good examples, and there is no reason why sorts equal or even superior to these should not be produced. Of the well-known standard varieties, such as Marguerite, Trollop's Victoria, British Queen, Pink's Prolific, Federation, Melba, and Edith, and

several others that have been grown from time to time in this State, few are now planted. Phenomenal (a Gympie raised seedling) and Auric, another variety of local origin, are now the varieties most commonly met with; other new varieties are being tested and some of them may prove to be adapted to our local conditions. The type of strawberry best suited to this State is a vigorous healthy grower—that is, a good bearer and producer of good coloured fruit of good, firm texture and fine flavour; a fruit that keeps and carries well, and that meets the requirements of both the fresh fruit trade and of the jam maker.

As strawberry seed is freely produced and readily germinates, raising seedling plants, which usually fruit the following season is recommended. By careful selection there is reasonable possibility of effecting improvement on existing varieties. Seed should not be collected indiscriminately but from fruit freely produced on plants showing marked vigour.

CARE OF THE COW AFTER CALVING.

By J. A. RUDD, L.V.Sc., Department of Agriculture and Stock.

CARE of the cow is more important than food at this very critical period of a cow's life. As calving occurs every year and with a healthy animal is a normal function on which so much after value as a dairy cow depends, it is necessary that her health and comfort should be studied if she is to continue as a profitable producer.

The First Thing to Do.

Assuming all is well and the cow has calved in good condition and is clean —i.e., voided her placenta or foetal membranes—the very next step is to clip the hair right off from below the vulva or external genital organs, under the tail, between the legs, right over the udder and teats and as far forward as the navel and milk veins showing under the abdomen. Clip likewise the tail down to the top of the brush, and wash this part thoroughly and give the udder and all parts which have been clipped a good soap lather, preferably with ordinary common soap. The object of this is to fill the pores which are now so stretched in the skin, so that no deleterious or disease spreading bacteria can enter the udder and pendulous parts of the body from outside for at least twenty-four hours or even more. The cow when lying down rests her udder on her hind feet, and if the udder is inflamed she puts on body pressure in order to relieve pain. As the udder lies between the body and hind legs, it is therefore essential that the hind feet should be kept clean and free from mud and filth.

Other Measures for After Care.

The next step is to make certain that the uterus, which is now about 8 feet long with thickened walls, due to a very big blood supply, should be encouraged to contract normally and rapidly so that all fluid contents which are harmful to the cow's health may be expelled as quickly as possible. The fact that this uterus is in a very pathological condition from the time the calf is born until it contracts to normal should not be lost sight of, for so much depends on the healthy state of this organ as to whether the cow conceives again normally, and gives of her best at the bucket. A cow with a diseased or septic uterus does not milk up to her full capacity. Pain which is constant, plus the fact that her constitutional vitality, which includes her digestion, is impaired as the result of an endeavour on the part of certain vital organs having extra work to neutralise the toxins from a pathological condition of the uterus, leave her open to attack in other parts of the body, such as the udder, and it can be definitely stated that an unhealthy uterus is one of the chief causes of a first class dairy cow otherwise healthy contracting mastitis from some unknown source. The conditions favourable to such a state must exist before a cow can become infected with mastitis, or any other disease of a contagious type; the natural resistance of every animal to disease is very great provided the vitality has not been lowered by a preventible ailment. The question arises how can one assist the rapid contraction of the uterus. Nature has provided for this very important function by making the sucking action of the calf the main factor in bringing not only a rapid contraction of the uterus, but also the expulsion of uterine fluids which, if left, will cause a great deal of trouble later on. The action on the part of the sucking calf cannot be explained, but it is known as a physiological action of great importance. The idea is fairly widespread that a calf should not be allowed to suck its mother at any time because it is supposed to prevent the cow from doing her best in the bail.

However much this opinion might have been or still is of value in dealing with ordinary mongrel bred cattle not of true dairy type, it is to-day a fallacy and in fact is a potent factor in not only spoiling a good cow, but also of destroying her splendid offspring, for the calf must suck and obtain the first milk from its dam in order that its bowels may be cleansed and its body may load up antibodies or preventives against disease. The only way that this important function can be performed is by the calf imbibing a sufficient quantity of the colostrum or beastings from its dam. It takes at least forty-eight hours for the calf to get sufficient from his mother to be of any practical value to him in his after life, and it is in this forty-eight hours that the cow derives her greatest benefit from its initial nourishment of her calf, as her uterus contracts from 8 feet with grossly thickened walls down to 2 feet with thinned walls and almost its normal size in this limited time. If the calf is left with its mother for four days this association between mother and offspring should be sufficient to place both on the high road to perfect health. There will be less milk fever, less mastitis, and less misery for both dam and offspring if this is carried out systematically and with the deliberation that is so essential in dealing with the improved modern type of dairy cow, in which mammary gland and other organs proportionately have been forced in order to obtain maximum production at the pail. If we get away from nature in this way by high production we must return to nature in other ways in order to compensate for such qualities as have been destroyed by artificial methods, and so preserve the balance which has been to a certain extent strained, if not destroyed, and assist the animal to regain the normal state.

A Matter of Common Sense.

The maximum amount of benefit accrues to the cow and her calf by adopting this simple method, which is one born of common sense and experience in the treatment of ailments which are common to dairy cows of the modern type, and which make then unfit permanently for the work which is ahead of them. A dairy cow is at her best, if she has been properly handled, at ten years of age and will continue so up to fifteen years of age, gradually waning as years pass on. I have known of dairy cows producing 18 lb. of butter for a week at twenty years of age, but these are exceptional cases only cited to show how it is quite possible even with maximum production to have longevity.

Care of the Calf.

The calf when taken away at the end of two or even four days should be left to fast at least twenty-four hours in order to give his overtaxed digestion a much needed rest, and also to make him anxious to drink out of the bucket of his own accord. It may be necessary to allow him to fast for even thirty-six hours, but longer than this is not advisable and a certain amount of persuasion may be necessary in order to induce him to start drinking from the pail. The cow is relieved of high tension when the calf is running with her, and when the calf is taken away she will, after twelve hours, give her milk freely.

It is not advisable to drain too much milk from an over distended udder at one milking and then not to empty the udder completely at any time for the first fourteen days—i.e., milk out but do not strip. Stripping with finger and thumb is a fruitful cause of what is commonly called Pea in the teat, which is only a warty growth in the passage or duct, due to extreme irritation of the highly sensitive mucous membrane of the teat duct. Once or twice all round with full hand on the teat is all that is necessary in order to empty the mammary gland without prejudicially affecting its productivity until the cow freshens on or about the twenty-eighth day after calving.

The calf does not actually feed on grass for twenty-eight days after birth but may peck at a few stems of hay, but if allowed to run at large before that time he is apt to pick bits of bark, paper, or rags, or even chips of wood, which may block somewhere about the region of the oesophogeal groove and cause endless trouble. A simple method of dealing with such a perverse animal is to tie him up for twenty-eight days and feed him on a fair amount of his dam's fresh milk for that period if possible; or even a small ration of it with skim milk and a little linseed oil—one teaspoonful of the latter to every three quarts of the mixed milk—i.e., separated milk and the whole milk of his dam. When the calf finally goes on to skim milk he is thus quite accustomed to his ration of linseed oil, which does not upset him, due to sudden change of diet, and he carries on without a check so that on the arrival of winter with the first snap of cold weather he is not found wanting; and no parasites, such as stomach worms, which are by far the greatest enemy of the poorly reared young calf, can find a lodgment in the viscera. In other words he is in a fit state to repel all parasites and bacterial invasion within

certain limits, which, of course, are in direct ratio to the first-hand methods employed in the very early stages of its career. What is the use of rearing calves in the early spring or summer only to die in the following winter, and unquestionably this is the state of a great many young calves which are reared annually on skim, separated milk alone without the addition of fat of any kind in place of that removed in the process of cream separation.

Dish skimming is quite another proposition, and good calves can be reared if the milk so treated is sweet and wholesome, even at the end of twenty-four hours' standing in shallow pans.

The branding, earmarking, and castration of bull calves may be carried out at nine months, when the calf is on good grass and well over his weaning period, but if calves are put out of their natural run into a back paddock they should be taken to water daily at least once in twenty-four hours, and this should be clean and wholesome, preferably water from a well or good running creek. Ordinary waterholes are often highly infected with the eggs of parasites which find lodgment in the stomachs of calves, which may be half empty, due to young animals being worried by their fresh surroundings and anxiety to get back to their natural beat where they were first reared or born. Waterholes that are merely the reservoirs of paddock drainage are positively the riskiest method, from a health standpoint, of watering all classes of stock of all ages that is practised at present. They should be fenced off if they must be used, and the water pumped into troughs; this would obviate the risks of parasitical disease to some extent.

THE FARM TRACTOR.

ENGINE FAULTS EASILY REMEDIED.

By E. T. BROWN.*

The constant movement of the valve in its guide tends in course of time to wear the latter. In the case of an inlet valve this causes a leak; therefore, the ingoing charge is diluted. It is possible to buy a gland for a leaking valve guide, but it is generally better to replace the guide with a new one. In the vast majority of instances, the guide is a driving fit in the cylinder casting. It is, therefore, rather difficult to remove. It does not do to tap the lower end with a hammer, as this burrs it and prevents it passing through the hole in the casting. A stubborn guide can, however, be removed in a simple manner with a home-made gadget.

A long, thin bolt should be taken, thin enough to pass through the hole in the casting and long enough to project above the top of the cylinder. A washer should be put on, the bolt inserted in the casting from the bottom, and a large washer and the nut put on the end. By tightening the nut the guide is withdrawn gently, but surely, from the casting.

In isolated cases the guide is integral with the casting. If the guide be worn it must be bushed. The same plan can be adopted for drawing the bush into position. This is, however, a rather delicate job, and extreme care must be taken with the long, thin bush; otherwise it will be knocked out of shape.

An Engine Assembly Tip.

When the cylinder block is being returned to position two of the four pistons should be at the top of their stroke with the remaining two at the bottom of their stroke. The pistons pass into the cylinders easily, but the piston rings are apt to foul the bottom of the block. This is due, of course, to their natural springiness. Force must not be used, as the rings are extremely brittle. Special clamps can be obtained for holding the rings in position, but it is possible to make a gadget at home that will answer the purpose equally well. A piece of hoop iron, 1½-in. to 2-in. wide and 18-in. to 24-in. long, according to the size of the piston, should be taken and bent around the piston. A third of an inch from where the two ends come together the ends should be bent out at right angles. This means that they are parallel, but slightly apart. A clip should then be made and slipped over the two ends, this being tight enough to bring them together. By moving the clip towards the piston the band is tightened. This compresses the rings, but the band is loose enough to slide down the piston as it is being inserted. For a four-cylinder engine two clamps should be made, these being used first for the two top pistons and later for the lower ones.

* In the "Farmer and Settler."

Exhaust Pipe Heat.

If the exhaust pipe comes anywhere near the driver's feet the heat tends to be oppresive. No floor boards are fitted, as a general rule; hence there is no protection. The heat can be eliminated to a very great extent by wrapping asbestos cord round the pipe. Asbestos is a perfect insulator, and is used largely for steam pipes with a view to reducing the loss of heat. In some cases it is possible to arrange for additional protection by fixing a piece of asbestos sheet above the exhaust pipe.

If coil ignition be the system adopted on the farm tractor, the operator should understand how to detect faults as they arise. If the engine will not fire and no conclusion can be arrived at regarding the cause the engine should be run with the starting motor, after switching on the ignition, and the ammeter watched. If it be seen that the reading rises and falls it may be taken that the low-tension wiring is in order. If the reading is steady the make-and-break mechanism should be examined, and if found all right there is probably a shortening in the low-tension circuit.

If no reading be obtained, it indicates either that the accumulator is exhausted or that there is a loose connection or a broken wire in the low-tension wiring. The fault should be looked for in the cables running from the junction-rod or switch to the coil, or from the coil to the distributor, and the terminals on the accumulator should also be looked to. To test the coil, apart from the distributor, the engine should be turned by hand with the ignition switched on, and a cable removed from the central distributor terminal and held half an inch away from any metal part of the chassis. If the coil be in order, a strong, regular spark is obtained.

Radiator Water Level.

The water level in the cooling system must be maintained if the engine is to function normally. The conditions under which the farm tractor works are such that rapid evaporation is usually the rule. When the water is cold it should be 2 inches to 3 inches below the overflow pipe; the system will be full when the water expands when the engine is hot. So long as the water comes above the inlet pipe there is no call to add more, but on no account should it be allowed to fall below this.

THE WHEELS OF THE CAR.

VARIOUS TYPES COMPARED.

By RADIATOR.*

History has no record as to who was the inventor of the wheel as an assistance to transport, but certainly wheels have always been a most vital portion of vehicles of transport, and probably there exists to-day no better examples of what can be done with wheels than in the motor car. The service that must be done by a car wheel is greater than that of any other vehicle, even the railway train. The wheels of the latter may run at high speed, but they do not encounter the road bumps of a car's wheels.

In the days before motor cars the wheels of nearly all motor vehicles were made of wood, with an iron tyre. Because of the use of those wheels on gun carriages by the army, the wheels were sometimes known as artillery wheels. It was not unnatural that the first cars were fitted with wooden wheels, and these wheels applied to cars became generally known as artillery wheels.

The wire wheel works on a fundamentally different principle from that of the wooden wheel. In the latter case the weight of the axle rests on the lower spokes so that the spokes at the bottom are in compression. The wire wheels on the other hand are so arranged that the hub hangs from the top of the rim; that is, the upper spokes are in tension. The wire wheel is remarkably strong and has the great virtue for high speed work that although it is possible to buckle it, it is practically impossible to completely smash it. The chief objection to the wire wheel is the fact that it is very difficult to clean. This objection has been overcome in the case of certain high priced cars by covering the spokes with light sheet metal discs.

A more modern type of wheel is the steel artillery wheel (often known as the Sankey wheel). This wheel consists of two sections of pressed steel welded together to form an all-steel wheel with tubular spokes. This type of wheel is becoming increasingly popular. The reason why the wheel was not developed years ago is that the electric welding process used in joining the two halves of the wheel is only a comparatively recent innovation in the steel-making industry. This wheel has not the resiliency of the wire wheel, but it is otherwise quite a good job.

* In the "Farmer and Settler."

Another type of wheel that was very popular a couple of years ago is the disc wheel. The disc wheel consists of a pressing of mild steel to which the rim is riveted. The disc wheel has the great advantage that it can be cleaned in a very short time, but there is the objection that it behaves somewhat like a drum and so adds to the noisiness of the car.

From the point of view of the Australian country driver, the artillery (either wood or steel) wheel has a great advantage over other types inasmuch as it is possible to coil a rope or chain around the tyre and rim should the car become bogged. This trick is impossible with disc wheels, and is liable to damage the very light spokes in a wire wheel.

Virtues of each Wheel.

It is difficult to decide which is the best type of wheel and much depends on the taste of the owner. The wire wheel is, if anything, the best wheel for riding comfort, and also gives slightly the longest tyre life. However, it is the most expensive as to first cost and takes a wealth of trouble to keep it clean. The disc wheel, although easy to keep clean, is noisy and rigid. The wooden artillery wheel is rigid and tends to develop squeaks when the wood shrinks and thereby loosens the joints. The steel artillery wheel is rigid and although a good job is a little unsightly in the opinion of the writer. A rigid wheel means that the tyre life is not quite so long as with a resilient wheel.

Detachable Wheels.

Practically all cars on the road to-day have either detachable wheels or detachable rims, so that in the event of a puncture the motorist can replace the whole wheel or rim without the bother of mending the puncture on the road.

The detachable rim is much more popular on American cars than on British vehicles, also the wooden artillery wheel is essentially an American fashion.

Disc, wire, and steel artillery wheels have for many years been detachable, but it is only quite recently that the wooden detachable wheel has made its appearance, and a very smart looking job it is.

The detachable wheel is secured in position by various means. In all cases a hub is mounted on the axle end and over this hub is pushed the hub sleeve, which carries the wheel spokes. In many cases the hub sleeve is held to the hub by a number of capped bolts, while in other cases the hub has a special wheel cap screwing on to the hub, which holds the wheel in place. Most of these latter type have a special locking device which the owner should always check to see that it works when a wheel is replaced.

Where the wheel is held on by a number of bolts, they should be occasionally checked to see that all are tight. A little grease on the shanks of these bolts will often remove unpleasant wheel squeaks.

Where detachable rims are used, the motorist should, when replacing tighten all bolts equally so that the rim will be symmetrical on the wheel. Nothing wears tyres so rapidly as a rim set a little askew.

The tyre and tube on the rim of the wheel serve to insulate the chassis from all minor road irregularities, while the springs insulate the car from the major bumps.

Tyres.

Years ago the fabric tyre was the only type; this tyre was built up from layers of canvas and rubber. To-day, however, the cord tyre has completely superseded the fabric tyre. The cord tyre carcass is built up of cotton cords impregnated with rubber and surrounded by rubber. To this carcass is vulcanised a thick rubber tread. The cord tyre is capable of standing far more flexing than the fabric without the walls breaking. Because of this fact the introduction of the cord tyre was followed by the introduction of the low-pressure or balloon tyre. In the fabric tyre days, the pressures used in tyres varied from 50 lb. to 80 lb. to the square inch, whereas, to-day, the pressure varies from 20 lb. to 35 lb. to the square inch, depending upon the size of tyre and weight of vehicles.

The makers of tyres recommend pressures to be used for various wheel loads on any size of tyre. This pressure recommended is always the lowest pressure consistent with long life in the tyre, so that the owner may have the maximum comfort due to a soft tyre, but yet not destroy the tyre due to under-inflation. The reader would be well advised always to adhere to the tyre manufacturers' recommendations, and to purchase a pressure gauge with which to check the pressure.

CLIMATOLOGICAL TABLE—JANUARY, 1930.

Supplied by the Commonwealth of Australia Meteorological Bureau, Brisbane.

Districts and Stations.	Atmospheric Pressure. Mean at 9 a.m.	Shade Temperature. Means. Max.	Means. Min.	Extremes. Max.	Date.	Min.	Date.	Rainfall. Total.	Wet Days.
	In.	Deg.	Deg.	Deg.		Deg.		Points.	
Coastal.									
Cooktown	29·72	88	76	96	15	73	9, 10, 11, 20	3,080	18
Herberton	..	79	66	87	13, 14	57	13	1,746	25
Rockhampton	29·80	85	72	98	14	68	12.30,31	2,659	23
Brisbane	29·92	83	69	95	20	64	29, 30	994	23
Darling Downs.									
Dalby	29·88	86	65	100	19	58	11	386	14
Stanthorpe	..	79	61	97	19	51	11	208	14
Toowoomba	..	78	61	93	20	56	3, 6, 7	649	18
Mid-interior.									
Georgetown	29·69	90	74	98	1	70	31	714	22
Longreach	29·73	98	75	108	13	68, 69	29	399	10
Mitchell	29·83	90	69	103	19	58	1	228	6
Western.									
Burketown	29·68	93	78	102	3	65	7	871	12
Boulia	29·72	101	75	109	19	67	1, 2	18	1
Thargomindah	29·80	95	75	105	11, 12	63	4	127	3

RAINFALL IN THE AGRICULTURAL DISTRICTS.

Table showing the Average Rainfall for the Month of January in the Agricultural Districts, together with Total Rainfall during January 1930 and 1929, for Comparison.

Divisions and Stations.	Average Rainfall. Jan.	No. of Years' Records.	Total Rainfall. Jan., 1930.	Jan., 1929.
North Coast.	In.		In.	In.
Atherton	11·64	29	23·99	17·03
Cairns	16·24	48	33·06	26·99
Cardwell	16·46	58	38·64	28·01
Cooktown	14·21	54	30·80	24·27
Herberton	9·62	43	17·46	14·40
Ingham	15·94	38	25·42	31·09
Innisfail	20·03	49	34·56	35·58
Mossman	15·08	17	42·93	36·38
Townsville	11·29	59	17·58	15·96
Central Coast.				
Ayr	11·44	43	14·36	25·38
Bowen	10·20	59	20·46	33·32
Charters Towers ..	5·54	48	11·19	3·15
Mackay	14·22	59	30·70	16·64
Proserpine	16·14	27	28·53	39·62
St. Lawrence.. ..	9·62	59	17·47	8·14
South Coast.				
Biggenden	5·37	31	9·66	5·65
Bundaberg	9·06	47	15·92	4·21
Brisbane	6·52	79	9·94	4·60
Caboolture	7·77	43	11·17	6·62
Childers	7·82	35	14·02	6·37
Crohamhurst ..	12·74	37	22·91	12·37
Esk	5·84	43	7·71	10·74
Gayndah	4·72	59	9·29	10·53
Gympie	6·75	60	12·11	9·34
Kilkivan	5·64	51	10·57	13·43
Maryborough ..	7·54	58	11·34	4·18

Divisions and Stations.	Average Rainfall. Jan.	No. of Years' Records.	Total Rainfall. Jan., 1930.	Jan., 1929.
South Coast—continued:	In.		In.	In.
Nambour	9·91	34	19·18	9·46
Nanango	4·75	48	3·92	9·51
Rockhampton ..	8·34	43	26·59	3·89
Woodford	7·95	43	15·15	13·22
Darling Downs.				
Dalby	3·32	60	3·86	1·81
Emu Vale	3·31	34	1·32	2·48
Jimbour	3·65	42	2·31	1·53
Miles	3·78	45	2·45	1·28
Stanthorpe	3·62	57	2·08	1·73
Toowoomba ..	5·03	58	6·49	5·00
Warwick	3·58	65	2·03	2·43
Maranoa.				
Roma	3·26	56	1·53	1·24
State Farms, &c.				
Bungeworgorai ..	1·98	16	2·16	0·80
Gatton College ..	4·14	31	5·95	2·46
Gindie	3·74	31	6·88	1·30
Hermitage	3·31	24	..	3·23
Kairi	8·60	16	..	21·97
Mackay Sugar Experiment Station ..	14·34	33	28·94	16·33
Warren	5·22	15	..	0·44

GEORGE G. BOND, Divisional Meteorologist

Answers to Correspondents.

BOTANY.

The following answers have been selected from the outgoing mail of the Government Botanist, Mr. C. T. White, F.L.S.:—

Melia as a Febrifuge.

F.P.D. (Kuranda, North Queensland)—

We have no definite information as to use of Melia as febrifuge, though probably it is used in some places, for Melia trees are largely planted throughout the tropics and subtropics of the world, and the Australian one is generally put down as a variety of *M. azedarach* widely spread, wild or cultivated, over the tropics. The inner bark, especially that of the root, has been used as a remedy for intestinal worms. It is cathartic and emetic, and has been used for cholera. The fact of its being used for this purpose is due to its bitter nature, so it is quite likely that it has been used to mitigate fevers in some parts of the world. The berries, as you know, are poisonous, and every year we generally receive specimens for identification with a report that they have been the cause of the death of pigs, the plants growing over pigsties having been left for shade. Birds, however, seem to eat them with impunity. We have heard of a decoction being prepared from them and sprinkled on plants to protect them from attacks of insects.

Horse Mushroom.

W.T.N. (Buderim Mountain)—

There is little doubt that the mushroom described by you represents the Horse Mushroom, *Agaricus arvensis.* This is edible and only differs from the common field mushroom, *Agaricus campestris,* in being larger and coarser in all its parts. There is no definite way of telling edible from poisonous mushrooms. The change of colour of the flesh, the floating or sinking in water, the discoloration of a silver spoon, and other tests cannot be relied on at all. The only way is to actually know the mushrooms with which you are dealing. A rule always to follow is this—that where you see a mushroom with white gills, a ring round the stem, and a volva or bag at the base of the stalk, these are always to be avoided. Some mushrooms are poisonous to some and harmless to others. It is a safe rule with mushrooms never to take a hearty meal until they have been tried in small quantities on account of the individual differences of people. First cook in small quantities and taste discreetly.

Fairy Floss—Native Flora.

S.A.S. (Thulimbah)—

Helichrysum diosmifolium is very common in Southern Queensland, and is generally known to the children as Fairy Floss, and Pills Plant is another local name we have heard given to it. It grows with two forms, one with white, the other with pink flowers. The pink is common, we think, in the granite belt. It is distinguished by the little flower heads, and the leaves are small and rather strongly scented. *Choretrum candollei* is a leafless shrub with long, slender, wiry branches, bearing in spring time a profusion of very small white flowers. The boronia is probably either *Boronia granitica* or *Boronia repanda.* Most likely they are both growing in the granite belt. The flowers of this little shrub vary from a pale pink to a very deep pink, almost carmine.

If you wish to know the names of the wild flowers of your district it would be as well to send to us next season small pieces a few inches in length pressed flat between sheets of paper before sending; number each specimen, and names will be advised according to their numerical order.

Quinine Berry—Emu Apple.

J.D.R. (Yeulba)—

Your specimen is *Petalostigma quadriloculare,* commonly known in Queensland as the Quinine Berry, though we have also heard it called Emu Apple and the tree referred to as Bitter Bark or Native Cinchona Tree, though these latter names more strictly belong to another tree, *Alstonia constricta,* fairly common in Queensland, and the bark of which has some value as a tonic. The Quinine Berry or Petalostigma is very common in parts of Queensland, and in some places, particularly in parts of the West and Central Queensland, makes a very nice, shapely, shade tree. The berries or fruits are very bitter, but are not known to have any values as a tonic or medicinal virtues.

Thorn Apple *(Datura stramonium).*

T.J.T. (Beaudesert)—

Your specimen is *Datura stramonium,* the Stramonium or Thorn Apple. It is one of the worst weeds we have, and as the seeds are supposed to be the most poisonous part of the plant there is no doubt at all, we should say, that the weed was responsible for the death of the pigs. It is a plant of rather nauseating taste, and as a general rule stock do not eat it unless it it chaffed up by mistake with other fodders.

Nut Grass Eradication.

R.B. (Wondai)—

Poisonous sprays have always proved of little or no value in eradication, but experience both here and abroad has shown that small patches can be eradicated by the application of cheap grade salt—such as waste salt from butchers' stores or hide stores—at the rate of ½ lb. per sq. ft., either dry or in the form of brine. It is practically impossible to entirely eradicate Nut Grass where the weed covers extensive areas, but it can be kept in check by proper handling, particularly where the land is used for large crops such as cotton and maize. The rows between the standing crops should be regularly cultivated so that the green shoots are cut off below the surface of the ground. At first the cultivation should be carried out at least once a week, gradually extending the interval as the weed becomes less aggressive. We must not forget that the Nut Grass tuber is a storehouse of nutriment for the young shoots. So long as no shoots are being sent up the tuber remains dormant, but in cultivated land the food material stored in the tuber is being used up in the formation of the young shoot. Cut these off regularly and the tuber eventually becomes exhausted. Another point is that the formation of fresh tubers is absolutely dependent upon the leaves, and if these are not allowed to grow fresh tubers cannot be formed, and the old ones must die of exhaustion. This method means a great deal of work, but it is either continuity of the work of eradication or leaving the Nut Grass entirely alone; there is no half-way method.

Ornamental Trees.

H. McC. (Millaa Millaa)—

Quick-growing ornamental trees which might succeed at Millaa Millaa are:—Coral Tree (*Erythrina* spp.); Poinciana (*Poinciana regia*); Jacaranda (*Jacaranda mimosaefolia*); Silky Oak (*Grevillea robusta*); Cape Chestnut (*Callodendron capense*); Flame Tree (*Sterculia acerifolia*); Candle Nut (*Aleurites mollucana*); Rain Tree (*Pithecolobium dulce*); Cypress Pines and Ordinary Pines (any varieties obtainable in North Queensland).

Young plants should be obtainable through any nurseryman at either Charters Towers or Townsville or you could write to the Director, Botanic Gardens, Townsville, who could put you in touch with supplies. Mr. H. Wright, City Gardener, Cairns might know some local nurseryman there who could supply your wants.

Wild Tobacco.

R. H. (Chinchilla)—

Your specimen is the Wild Tobacco, one of the varieties of *Nicotiana suaveolens.* The plant is very common in various parts of Queensland and sometimes coming very thickly on the edge of the dry scrubs of the Western Downs. It contains the alkaloid nicotine, and is poisonous to stock, though at times the stock seem to eat it without ill effects following.

YOUTH AND THE JOB.

"As youth faces its great task to-day," said Lord Moynihan in a Burnley speech reported in the "Yorkshire Post," "let it remember that there is something more in the task than the completion of it. When I listen to my friends who engage in business of any kind, whether they are masters or workmen, I hear of almost nothing but 'hours of labour,' 'rates of pay,' 'new distributions of authority,' and 'management and direction.' All are very necessary, but I confess to a great longing to hear of the spiritual side of labour, of men's purpose and pride in their efforts. I am eager to hear of the value of the professional spirit of men thinking less of what they get out of their job than of what they put into it."

Photo.: E. Rye.]
PLATE 67.—CANUNGRA CREEK FALLS.

WHAT WE HAVE LOST.

There was never before, perhaps, a period in which work had less spiritual value for most people than it has to-day. The worker himself has been lost in the complicated machinery of production, and in our worship of efficiency the machinery has come to be considered somehow such a desirable good in itself as to warrant any sacrifice in its name. Social intercourse in the same way has succumbed to the machinery ostensibly provided for it. Clubs and organisations of all sorts for bringing people together are legion, but conversation has almost as completely disappeared as has letter writing between friends. We are so busy and wearied in rushing from one meeting to another that our minds have almost entirely ceased to meet. We have lost the power to see life steadily and see it whole. We see only parts, the physical part, the machinery part, and have failed to see the end of all these things, the full rounded life of the spirit for the growth of which alone these other things have any validity or value. Of what possible use is a machine, whether it is a dynamo or a university, unless it is to produce something of essential value for human life?—James Truslow Adams, an American thinker and philosopher.

Photo.: E. Rye.]
PLATE 68.—SUNSHINE FALLS—ABOVE CANUNGRA CREEK.

THE LESSON OF THE BOY SCOUT MOVEMENT.

"There are still worthy people who, being ignorant of physiology, live in an unreal world, and are even yet unaware that unless and until you cultivate and develop the body and brain of the child all attempts at intellectual instruction will prove futile. They are the witnesses of the triumphant contribution of the Boy Scout Movement, and render it a lip service of praise, but they decline to learn from it. Yet its lesson is profoundly true and full of meaning to all educationalists in this generation. It is a lesson of physical discipline, of educational adventure, of youthful training and glad obedience; it is one of the wise interpretations of that service which is perfect freedom; it educates by equipping the body first and drawing out its faculties and senses; it both harnesses and develops the boy and leads him of his own interest and desire into the path of manual work and the arts and crafts; it trains men not for the classrooms or the pedagogue but for life."—Sir George Newman, Chief Medical Officer of the Board of Education, in his report for 1928 on "The Health of the School Child."

General Notes.

Staff Changes and Appointments.

Mr. J. E. N. Bell has been reappointed Government Representative on the Dawson Dingo Board.

Mr. Charles Queale, Inspector of Stock, at present attached to Brisbane, has been transferred to Dalby.

Mr. H. J. Walker has been appointed Temporary Inspector of Slaughter-houses for the period from 6th January to 29th April, 1930.

Mr. H. Afford, of Birdsville, has been reappointed Government Representative on the Diamantina Dingo Board; and Mr. C. C. Morton, of Boulia, has been appointed a member of that Board.

Messrs. R. G. C. Fraser, S. R. Trundle, A. Marshall, and G. E. V. Wort, Councillors of the Cleveland Shire Council, have been appointed Honorary Rangers under the Animals and Birds Acts.

Constable D. P. O'Sullivan, of Tara, has been appointed an Inspector of Slaughterhouses; and Mr. P. J. Short has been appointed a temporary Inspector of Stock and Slaughterhouses for the period from 21st December, 1929, to 4th March, 1930.

The services of Mr. F. C. Shaw, Temporary Inspector of Slaughter-houses, have been continued for the period from 5th February to 17th May, 1930, in order to relieve Mr. J. R. Collier, Inspector of Slaughter-houses, Cairns, who will be on leave for that period.

Mr. F. H. S. Roberts, M.Sc., of the Prickly-pear Station, Gogango, via Rockhampton, has been appointed an Entomologist on probation, Department of Agriculture and Stock; and Mr. Robert Veitch has been appointed Chief Entomologist, Department of Agriculture and Stock.

Sugar-cane Prices Board.

An Order in Council has been passed removing all members of Local Sugar Cane Prices Boards throughout Queensland who were appointed by notices dated 23rd March, 4th May, 8th June, and 31st August, 1929. These members were appointed for the 1929 cane-crushing season only. As this season is now finished, these members have been removed from the Boards to which they were appointed so that new members may be appointd for the 1930 season.

Honey Board to Control Honey and Beeswax.

Nominations will be received by the Returning Officer, Department of Agriculture and Stock, Brisbane, until 5 p.m. on the 3rd March, 1930, for election as growers' representatives on the Honey Board.

Four such representatives are to be elected by persons who subsequent to the 10th April, 1929, owned at least five hives of bees in movable frames and market the honey and beeswax therefrom. Each nomination is to be signed by at least seven persons owning bees as described.

Canary Seed Board.

An Order in Council has been passed giving notice of intention to extend the duration of the Canary Seed Board for a further three years. The present Pool expires on the 28th February, 1930, and this Order in Council gives notice of intention to extend the pool until 28th February, 1933. The notice contains an invitation to demand a poll to decide the question of continuance or otherwise. This petition must be signed by not less than 10 per cent. of canary seed growers. If it is received a referendum will be held, and a simple majority will decide the extension or otherwise. If no petition is received the Pool will be automatically extended.

Fruit Marketing Organisation—Statutory Extension.

On the 26th September, 1929, an Order in Council was passed giving notice of intention to extend the operation of the Fruit Marketing Organisation Acts for a further five years as from 1st January, 1930, and calling for a petition of 500 fruitgrowers for a referendum to decide whether or not the Acts should be extended as suggested. A petition was received, and a vote taken on the question. As the vote was in favour of the continuance of the Acts, an Order in Council has now been passed continuing the operation of "*The Fruit Marketing Organisation Acts*, 1923 *to* 1928," for a further five years as from 1st January, 1930; that is, until 31st December, 1934.

Too Young at Eighteen.

Whether a youth of eighteen years is too young to drive a heavy motor lorry was one of the questions discussed at the recent commercial motor show in London. The general opinion seemed to be in agreement with Major-General S. S. Long, a director of Lever Brothers, Limited, who raised the question. For a lad of eighteen to drive a heavy motor vehicle was to ask for trouble, he said. The lad might have a lot of road sense, but there was a lot of dare-devil in him. He could not have the road sense of a man of forty.

Not too Old at Sixty.

To-day's limitations on the commercial value of a man have nothing at all to do with the number of years lived. There is a place for everyone who is willing to work, and to try to go forward, says Mr. Henry Ford in the course of an interview published in the "Ladies' Home Journal." "After having employed hundreds of thousands of people at the Ford works," he continued, "we have come to think not at all of age, but only of experience and the capacity to learn. In point of fact, we should prefer, if we could make the choice, to have all of our people between thirty-five and sixty years old, for then we should have a stable and experienced force. We should not care how much over sixty the men were so long as they could do their work. In no circumstances would we have a force made up solely of young men."

Fur-bearing Rabbits.

An Order in Council has been issued bringing fur-bearing rabbits under the provisions of the Animals and Birds Acts, and additional Regulations have been promulgated under those Acts specifying the conditions under which Angora, Chinchilla, and hutch fur-bearing rabbits may now be kept in Queensland. Every person who wishes to keep these rabbits must obtain a license from the Under Secretary, Department of Agriculture and Stock, Brisbane, the fee being according to the number of rabbits held. The license to keep up to 25 is 10s., and the fee proportionally increases with the number of rabbits until it reaches £2 for anyone keeping from 201 to 400 rabbits. For each 100 animals or part thereof a further 10s. is then charged. Licenses are not transferable. The rabbits must at all times be maintained in a rabbit-proof enclosure, constructed according to specifications supplied by the Department. It must be kept padlocked at night and at all other times when not under direct personal supervision. The rabbits must be kept in hutches within the enclosure, and these hutches must also be kept padlocked. The carcasses of all rabbits that die from disease and all excreta must be destroyed by fire. No rabbits can be removed from the enclosure without the permission of the Department of Agriculture and Stock. It must be distinctly understood that the only rabbits that can be kept are purebred Angoras and Chinchillas or other approved fur-bearing rabbits.

Licenses will only be issued in the following pastoral districts:—The Darling Downs, Moreton, Wide Bay, Burnett, Port Curtis, South Kennedy east of the 148th meridian, North Kennedy, Atherton, Cairns, Innisfail, and Herberton.

Obituary.

The late Mr. Lawrence P. Doyle, Inspector of Stock, Mount Isa, who was accidentally drowned on the 4th instant while attempting to cross Lagoon Creek, near Mount Isa, was a very promising officer of the Department of Agriculture and Stock. After passing the examination for Stock Inspectors, the late Inspector Doyle was appointed to the Kingaroy district in January, 1926, and was later stationed at Cooyar, Cloncurry, Julia Creek, Camooweal, and had only recently taken up his duties at Mount Isa.

During his regrettably short term of service Mr. Doyle became very popular with his fellow officers, and the manner in which he carried out his duties was fully appreciated by the Department and the stockowners generally, for he displayed keenness and exceptional ability in his work. Much sympathy is felt for his parents, Mr. and Mrs. T. Doyle, Ashgrove, in the loss of their son, who was only twenty-six years of age at the time of his death.

Proposed Barley Pool.

A notice of intention to create a Barley Pool has been passed by the Executive Council. The notice will stand for thirty days, and within that time any thirty barley growers can petition for a referendum to decide whether or not such pool shall be established. If a referendum is held a majority of 60 per cent. will create a pool. If no petition is received the pool will be created automatically.

The pool applies to all barley produced in Queensland, and will last for seven years. The Board will consist of two elected members and the Director of Marketing. The Board will be a marketing board, and all barley will become the property of the Board.

For the referendum (if any), any person who grew barley for sale within the last three years shall have a vote.

Subduing Tuberculosis.

Much evidence can be cited (says an American report) from breeders' experience in America to show how erroneous is the reasoning of those who would let bovine tuberculosis run its course. In many States tuberculosis is on the decrease, and, notwithstanding the imperfection of the tuberculin test, real progress is being made in subduing this cattle disease. A recent report from the Michigan Department of Agriculture states that, in Ogemaw county, nearly 12,000 cattle were tested and only nine reactors found. In another county, where 32,000 cows were tested, only 212 reactors were found, when on the first test there were nearly 1,500. In other words, the percentage of infection in this county on the first was 4.78 per cent., while on the second test it was only 0.66 per cent. "We can hear some say that the tuberculin test does not reveal the diseased animals," adds the report. "To this it can be stated that the animals slaughtered from these sections show a marked decrease in tuberculosis. In fact, in some sections scarcely any diseased animals are found upon slaughter at the packing houses."

World Congress of Poultry Breeders—Proposed Queensland Representation.

Next year a world congress of poultry breeders and poultry fanciers will be held at the Crystal Palace, London. The United Poultry Club and the National Poultry Breeders' Association are anxious that Queensland should be represented at that conference, so that the industry might benefit as the result of the observations of a delegate from this State. With that object in view a deputation representing the organisations concerned waited on the Minister of Agriculture and Stock (Mr. H. F. Walker) and urged that Mr. P. Rumball (Government Poultry Expert) should be sent by the Government and those engaged in the industry in Queensland to represent the State. The members of the deputation stated that so earnest were those engaged in the industry that they would be willing to contribute a quota of the expenses involved.

Mr. Walker stated that the Government would be quite unable to finance such a project, no matter how desirable it was, but if the organisations concerned could place before him a concrete proposal to cover the expenses of the expert abroad the Government would be prepared to pay his salary.

The deputation comprised Messrs. J. F. Haynes (United Poultry Club) and A. Cousner, and S. Lloyd (National Poultry Breeders' Association).

Mr. Haynes declared that the poultry breeders were agreed that Mr. Rumball was the man most fitted to represent the State. If the Government would make his services available those engaged in the industry would co-operate with the Government in every possible way.

Mr. Cousner said that the poultry industry was more valuable than the wheat industry, and was well worthy of the expenditure of a few hundred pounds.

Mr. Lloyd pointed out that in addition to studying the scientific side of poultry breeding, the representative of the State could also gather much useful information relating to the marketing of products.

In reply the Minister stated that at a recent conference of Ministers of Agriculture he had proposed that the Commonwealth should send an expert to the congress, the expense to be borne jointly by the States. That proposal, however, was not agreed to. Due to the finances of the State the Government was unable to foot the bill of sending an expert overseas. The cost would not be a mere £200 or £300, as the members of the deputation suggested. If, however, those engaged in the poultry industry raised the money necessary to cover expenses he would agree to the services of Mr. Rumball being made available.

The members of the deputation stated that they would take steps to organise on the lines suggested before the end of February, by which time it should be possible to get in touch with poultry breeders in all parts of the State.—"Brisbane Courier."

An Economic Blunder.

Economically and in every other respect a nation can only thrive if it is composed of citizens sound in mind and body, and any taxation that makes the middle class sterile is a bad economic blunder.—Hartley Withers in ''Our Money in the State.''

Milk-Rot and a Remedy.

A Toowoomba subscriber writes:—''I never heard of a serious case of milk-rot until I got my hand bad with it recently. Since then, quite a number of people have told me of bad cases and the great danger of its spreading up the arm. My right hand midfinger is in a bad way . . . It seems to me right and fair to offer you these few lines on the subject in case you think well of inserting a warning note in your Journal. I would suggest the wisdom of milkers always washing their hands well after milking each cow, or as often as convenient at milking time. In case of any sign of milk-rot appearing I recommend bathing the hand in a hot boracic lotion and then applying iodine freely. I am suffering a good deal of pain and inconvenience for having neglected this precaution at the early stage of the trouble . . .''

Early Importations of Pigs.

Writing from his home at Koorama, Marlborough, Queensland, Mr. Albert Rake advises in connection with early importation of pigs into Australia that on looking up old records he has ascertained that his father, the late Charles Rake, of Enfield, South Australia, imported his first Middle Yorkshire pigs from England in the year 1889. At about the same time he secured some Improved Berkshires and Poland-Chinas from Sydney. The latter breed he secured from Mr. Woodhead, of Sydney, in 1881, these being, he understood, from imported American stock. Mr. Charles Rake also imported Ligurian or Italian bees for his apiary at Enfield, the one swarm he secured acting as foundation stock in South Australia. Of the Middle Yorkshire pigs Mr. Rake writes that they did a great business in these right up to 1905, when the family partnership was dissolved. Sales were made to breeders in all States, in Tasmania, and New Zealand. The price in those days, 4 guineas per head, was considered exceptionally good. The Yorkshires imported from England were bred by the late Mr. Sanders Spencer, two sows and an unrelated boar forming one of the early shipments. These pigs cost 60 guineas landed in Adelaide—also record figures of that period.

Points in Dairying.

The milking-shed and bails must be substantial and well built. Drainage, light, ventilation, protection of the persons milking and the cows from the prevailing winds, ease of cleansing, and good facilities for handling the cows are the main considerations. Fortunately, these can be accomplished at a much less expense than is usually believed. Concrete floors and gutters with ample fall are recognised as essential to a well-ordered milkshed and bails. Not only do these assist in securing good sanitary conditions, but they make it possible to effectively save all the fertility in the manure, as well as contributing to the comfort of those carrying out the work of milking.

Some dairymen feed their cows in the bails, but the ideal is to have independent and separate feeding stalls.

The use of odourless disinfectants in the milk-sheds at frequent intervals is desirable, as it is unreasonable to expect that the broom alone will keep the milk-shed as clean as is necessary.

The periodic use of lime wash is essential as a disinfectant, both to present and maintain a cleanly appearance throughout the shed. Unslacked lime sprinkled on the floor is most advantageous. The whole of the milking routine should be so planned that all operations that tend to raise dust take place after the actual milking of the cows is completed.

Milk yield must, however, always be considered in relation to environment. If a cow is pampered its yield goes up. The fact that a cow has given 1,200 gallons in a well-managed valley herd does not mean that it will be suitable for milk production on an upland farm. Hardiness must also be taken into consideration. Economy of production must never be lost sight of; that is to say, whether the cow is an economical converter of food. It has been shown that large food consumption does not necessarily mean increased yield. With some cows it does, but this is not invariably the rule. While on this point the maximum yield desirable might be considered. The 2,000-gallon cow is not an economic proposition for some breeders. Every breeder must judge for himself where his economic limit is in this respect.

Quensland Pig Industry Committee.

At the last meeting of the Queensland Pig Industry Committee, Miss Joan Mackay was appointed secretary in succession to Mr. E. J. Shelton, who has acted as chairman, secretary, and treasurer for a period of two years. Miss Mackay is also Secretary of the Queensland branch of the Australian Stud Pig Breeders' Society.

Work Does Not Kill.

Well-regulated work does not kill, it rather conduces to longevity. I have before me, while I write, the statistical bulletin of the Metropolitan Insurance Company of New York for January, 1929, and from which I extract data in support of the views I have advanced of the value of work as an agent making for longevity. We are familiar with the fact that in Britain the mortality rate of unoccupied persons is higher than that of those occupied. This experience is not confined to that country. Between 1911 and 1927 the death rate of both United States and Canadian wage earners and their dependents declined 33 per cent., while that of the general population dropped only 16 per cent. Consider for a moment what this decline in the death rate means. It means a considerable saving of the industrial life of these countries, in other words the life span has been extended. In 1927 the expectation of life among the wage earning classes was 56·42 years at birth, whereas sixteen years ago it was 46·63 years. The addition of nine years to the life expectancy of the industrial population of the United States, and of Canada, is a great acquisition, for, while this has taken place among the working classes, the gain in the life expectancy of the general population is only 6·06 years. Work is thus not a curse but a blessing to mankind.—Sir Thomas Oliver, Vice-Chancellor, University of Durham.

The Pig Section, Brisbane Exhibition, 1930.

The secretary of the Royal National Agricultural Association (Mr. H. W. Watson) has recently sent a circular letter to probable exhibitors at this year's Brisbane Exhibition that certain alterations and additions to the Pig Schedule have been decided on. These include several important alterations of which likely exhibitors should make careful note pending the issue of the complete schedule. They are: No quarantine restrictions at present operate between Victoria and Queensland, and it is hoped that prior to the date of entry the quarantine restrictions between Queensland and New South Wales will have been lifted:—

1. Not more than three entries may be made by any exhibitor in any one class.

2. In all classes for which there are eight or more entries a third prize will be paid, the amount to be one-half of the second prize in that particular case.

3. The Pig Pavilion will not be open to the public after 7 o'clock each evening of the Show.

4. All Stud Pigs, four months old and over, must be registered in the Australian Stud Pig Herd Book, &c.

5. Any sow entered in the Sow and Litter Class shall, if not farrowed on judging day, be allowed to compete in a "dry" class, and vice versa.

6. The sow in the Sow and Litter Class shall be eligible for entry in the open classes, and if successful will be allowed to compete for the Championships.

The general classification of ages in the Berkshires, Tamworths, Poland-Chinas, Duroc-Jerseys, and Gloucester Old Spots will run as follows:—

Boar, 2 years old and under 5 years.
Boar, 18 months old and under 2 years.
Boar, 12 months old and under 18 months.
Boar, 8 months old and under 12 months.
Boar, 4 months old and under 8 months.
Boar, under 4 months.
Boar and his progeny, progeny of any age, sex optional, to number three head, to be bred and owned by the exhibitor of the sire.

The classification for Sows in these breeds will be similar, with the addition of a Sow and Litter Class.

In Yorkshires, Large Blacks, and Chester Whites, the classification will be—

Boar, 12 months old and over.
Boar, under 12 months.

And similar age classification in the Sow Classes.

The schedule will contain a Litter Weight Contest, Porker, Pig, and Bacon Classes.

A Remedy for Sore Teats.

A Toowoomba reader writes:—"As a remedy for sore teats in cows, I have found fresh beef dripping the quickest healing thing."

Parental Authority.

My remarks upon "Natural Capacity and Health" in relation to careers would be incomplete if I ignored the claims of youth to settle its own affairs. This leads me to the subject of parental authority, giving—or not giving—way to the demands of the expanding intellect and the conscience of youth. A parent's decision should never be so inflexible that it remains to the bitter end; it should, for example, never thwart a son's career in a matter of conscience.

When the youth has reached the age of discretion a parent should not consider himself to be the sole arbiter of a son's conscience. In matters of faith a father may suggest and direct, but he cannot compel obedience. To make a career successful, there are other things to be considered than natural capacity and health, and these are personal choice and determination.—Sir Thomas Oliver.

What a Farmer Is.

A farmer is described as—

A capitalist that labours.

A man that works eight hours a day twice a day.

A man who has every element of Nature to combat every day of the year.

A man who is a biologist, an economist, and a lot more ists.

Who gives more and asks less than any other human being.

Who takes unto himself for his own sustenance and that of his family those of his own products that other people will not utilise.

Who gives more and asks less than big cities to infuse red blood into society that is constantly decadent and whose own salvation is the virility that it draws from the rural sections.

Who sells his products for what the other fellow cares to pay for them, and who buys the other fellow's products at what the other fellow cares to charge for them.

Start the Young Farmer Right.

Mr. I. F. Brown, buyer for Armour and Co., has been offering American calf club members some good advice:—

"One can never produce a good calf without good breeding. This does not refer alone to the amount of pure blood in the animal, but also to the indications of quick fattening and growth, as well as proper carcase proportions. I have seen some pure-bred beef animals which were quick, easy finishers that would make top carcases, and others in the same breed with just as much pure blood that were slow-maturing, long-legged, and rough-framed. One cannot select quality on breeding alone, but must look to the actual characteristics of the animal as well.

"Perhaps the greatest criticism that I find in the hundreds of club calves which I see and buy every year is the high proportion of this undesirable type of pure-breds. No matter what the club exhibitors may have paid for these calves when they were young, the high value does not exist in them when they reach me. A firm, smooth finish, with high carcase yield, is the essential, and the calf that excels in these particulars is the one that should always win."

Mr. J. H. Boyle, buyer for Swift and Co., speaks in a similar vein. He says:—

"I would like to emphasise this fact to you boys and girls. Start with a good quality calf, follow carefully and faithfully the handling and feeding of your calf so you can show a finished product when ready for market. By doing this you would be practically assured of prices above the average, and, if finished, you will have market toppers."

What these men say has been remarked and commented upon many times in our calf-club shows, remarks the "American Hereford Journal." Too many club members are equipped with poor calves to start with, and are expected to accomplish the impossible, which is to make prize-winners and market-toppers of them. There are still a good many people who believe that a pure-bred calf is a pure-bred calf, and that all that is necessary to give a boy or girl a running start for a club championship is to furnish them with a pure-bred calf. But there are many kinds of pure-bred calves, and if we are to get these boys and girls started off on the right track as feeders and breeders of beef cattle, we must get them to understand and recognise the right kind and the wrong kind .

Pig Feeding in Rhyme.

Mr. A. N. Duckham, during his association with the Cambridge Pig Recording Scheme, has issued between twenty and thirty "circulars" for the guidance of his members. They are bright and cleverly edited. The following extracts from a recent circular are typical:—

A Few Notes on Feeding.

Meal to water; one to three
Will with pigs and you agree.
More water in another trough
Makes sure your pigs will have enough.

The cost of the ration is what it produces, *not* the price per ton.

Two grains of common sense are worth 20 lb. of balanced rations.

Don't underfeed or overcrowd; one slum problem is enough. *But* overfeeding pigs underfeeds you.

It is an offence to add water to milk. It is almost a crime to dilute well-balanced proprietary or home-mixed meals with poor quality feeds or home-grown cereals.

Overfat and overweight pigs are market misfits. Water is the cheapest feed. The fatter and heavier the pig the less water it contains.

Meal Requirements.

Half the pounds per pig per day
Is stones per pig per week, we say.

If you want to make mistakes, mix the meal just before feeding. If not, mix at a quieter time of day. Half a ton at a time is a useful unit to mix on small farms where there are not many "bins" or men available.

Dry or Wet Feeding.

Which is the best depends on conditions on your farm. Both give equally good results. Extra labour of wet feeding balances losses due to wind and rats in dry feeding and cost of water carting. Dry feeding of a good mixture properly rationed *plus* freely available water is almost foolproof. Cubes worth about 10s. per ton more than meal in saving labour and wastage. For dry feeding outside on windy days, damp the meal slightly. In wet feeding always soak meal; this prevents swallowing or choking over lumps.

A Few Notes on Breeding.

Good feeding and sound management won't make silk purses out of "dud" sows' ears.

Don't prejudice a sow or a gilt. Let her have at least two or three chances of breaking her own record.

Select and weigh gilts for breeding at bacon weight. But only if they look like baconers and they come from sows with consistently good litter records.

Don't serve gilts too young. Nine to ten months is soon enough.

After four litters a sow's at her best.
Let her have eight; then a well-earned rest.

A good boar is half the herd. A bad one is three-quarters.

A "scrub" boar is the herald of misfortune; but a pedigree boar with a good record may be the dawn of an £ s. day.

Feed pigs by weight rather than age. Time and money spent on weighing is well repaid in small feed bills. Keep a check on pigs' feed consumption and rate of live weight gain. One pig-weighing machine is a better investment than several tons of pig condiments. Weighing makes trouble to-day, but saves money to-morrow.—"Live Stock Journal" (England).

THE JOURNAL APPRECIATED.

A Toowoomba reader writes (21st January, 1930):—"I find the 'Queensland Agricultural Journal' most interesting and helpful . . ."

Broom Millet—A Reminder.

With the crop nearing maturity, growers of broom millet may be reminded of the wisdom of field selection of seed.

Unfortunately, many farmers still rely on the "scoop shovel" method of obtaining their seed from the heap after hackling—a method which leads to great deterioration both in the yield and quality., The best growers select their seed in the field from the best heads. The number of heads required to sow a few acres is comparatively small, and the selection of seed in this way is justified by the improvement effected in the yield and the quality of the brush.

The most important points to look for in selecting seed heads are as follows:—

1. Fine, long, straight, round, abundant, uniform fibre with absence of thickened central stem.
2. Seed compactly situated mostly at the end of the brush (to facilitate hackling), the brush arising compactly in a close whorl from the stem and well exserted from the leaf sheath.
3. Freedom from disease such as red stain (on the brush and in the stem) and smut.
4. Good, plump, well-developed seed of light colour.

It is a good plan to have a special seed plot of broom millet where a few of the very best heads can be sown and in which improvement can be more quickly effected, as owing to the cross fertilisation which occurs plants with good brush may be cross fertilised by plants in the vicinity bearing poor brush, and with a smaller seed plot the selection may be made more rigorously with less chance of including the poorer types. Then sufficient seed can be selected each year to sow both the seed plot and the field area, keeping a few of the very best heads for the seed plot.

In the seed plot the heads can be left until they are properly matured before harvesting, though they may require protection in the field from birds, which can be given by covering them with a light muslin bag. After harvesting, the heads are thoroughly dried, hackled, and the seed cleaned and put away. Fumigation with carbon bisulphide and storage with naphthaline is recommended to secure the seed against weevils and grain moth.

The Modern Farmer—Science Sees Him Through.

The steady decrease in farm population in many countries gives the average man a sense of uneasiness about agriculture. Many farmers are actually ceasing to farm, and are moving to swell the ranks of city workers and eaters. Yet it would seem that, as the nation's mouths increase in number, the farm population should also increase. Something must be out of joint.

The new-type farmer is the joker in the logic. This farmer has learned to increase his wheat and butter without increasing the number of hands to do the work. He "knows how"—which is to say, he is scientific.

The work of the new-type farmer has been gradually revolutionising the farm, and even remodelling the man behind the plough and the herd. The new-type farmer struck up a very friendly acquaintance with the soils of his farm; he "jollied" the sour ones with lime, jacked up others with salts, fed them legumes, and then egged his perked-up soils on to his corn, wheat, and potatoes. He fashioned a better kernel on the cob and a better ear on the stalk. He learned what made winter wheat good, and at the last moment threw a double dose of protein into the head. He hit upon a standard family size potato that the housewife liked. He went after bugs, beetles, and borers with poison and gas. He serumed his pigs and shaped them for the selling scales. He turned eyes and testing tubes on his dairy herd, slashed it here, petted it there, fed it according to formula, and then watched the butter fat roll up.

In fine, whatever the crop, whatever the animal, this new type of farmer knows how to breed it, feed it, and sell it. His theory is that neither luck, tradition, nor old wives' tales can take the place of knowing how to farm. No wonder, then, that he discards hand tools and puts in the machine—the tractor, the combine, the milking machine, and so on. Moreover, the more he knows his job, the better he likes it. Getting close to his problem stirs his brain power into action, and the farm job takes on all the aspects of a challenging business.

Now it is nothing new that science is thus striking out into farming. But not everyone has yet realised the meaning of this movement—that the old "farming with ordinary skill" will soon be passing into history as a tale that is told. This is no discredit to the old farmer; he was a fine type of man. But one of these

newer farmers knows how to produce twice as much as the old farmer. Moreover, he has the ingenuity to improve his products, making them more desirable to the buyers. The "ordinary skill" farmer produces only mediocrity.

Will the farm population, then, continue to decline? Undoubtedly it will continue to decline to a point where the effective scientific machine farming will produce all that is needed. Is this the end of the story? By no means.

The recent revolution in farming has concerned itself with crops. But the progressive farmer is convinced that the same scientific methods he has learned to apply to running his farm can be used in conquering his other difficulties. The farmer's living conditions, for instance—community institutions, social status, opportunity for enjoying life in equal measure with persons in other occupations—have always had points of serious deficiency. Another revolution may occur here.

Science will penetrate and ramify through every phase of farm life. The new-type farmer is learning that men make their own living conditions, and that human elements can be combined to make needed institutions. He is not going to listen to the people who tell him that farmers can't get social amelioration. Does the farmer want facilities within reach for the health of his family? Yes, and he is going to change the health organisation of his section and have doctors and a hospital. Whatever he wants that average town communities enjoy he will learn to get.

When science was put into the hand of this new kind of farmer he was given a far-reaching talisman. And, if anyone thinks that the farmer will confine his Aladdin's lamp to wheat, cotton, and milk, he will be gravely disappointed, for the men who are coming to dominate farming are bound to know how public business is managed, how sound economic institutions are built, how living is made better—in fine, how things are done by human beings to bring welfare into being for themselves. He is looking to science to see him through, and, for one, I believe, not in vain.—C. J. Galpin, in "The Country Gentleman."

Correct Functioning of Tractors.—Traction and Wheel Slip.

One factor in tractor operation which gets but little consideration from the tractor owner, and which, in fact, we hear little about at any time, is the question of transmission of the power generated by the motor to the draw-bar.

Under stationary conditions a tractor engine develops a certain definite horse-power, but, when the travel of the machine itself is taken into consideration, this is considerably lessened by the effort required to move the machine over the ground. In this respect the wheels, their weight, their shape, their size, and the type of lug used is a big consideration.

It is generally considered that when working in soft ground the longer the lug the less slipping is experienced, but this is not always the case. If the top-soil is soft and the sub-soil is hard, then it is necessary to have a long wheel lug in order to get through the soft soil and get a grip on the hard soil beneath. Should a long lug be used in hard ground, however, very considerable effort is required to lift the weight of the tractor on to the lugs, which means considerable waste of the power being generated by the motor. Endeavour to always use the shortest lug possible, according to the class of land being worked and the load being pulled.

Slipping is a most common cause of waste of power, and the general reason for it is the overloading of the machine. When wheel slipping is experienced, particular care should be taken to see that the right type of lug is introduced in order to obviate it. In sticky ground, the best types of lugs are these which have the sharpest angle, and will allow themselves to be cleared. The wheel that fills up with dirt between the lugs simply increases its own diameter, thereby increasing the speed of the tractor, and decreasing the power of the motor, on account of the extra pull required with the bigger diameter wheel.

It can be seen from this that the wheels are closely related to the engine, and, if particular care is not given to the type and placing of the lugs, considerable power is lost with the resultant uneconomical working.

An overloaded motor is a quick-wearing one, which rapidly depreciates and becomes costly in upkeep. If you must overload your motor, then see to it that you are using a fuel which will give you the best results under the circumstances. There is no doubt that the premier tractor fuel to-day, which can be depended on, not only to give greatest power and economy, but also to give those essentials of good idling and easy starting under bad weather conditions, with a minimum of crankcase dilution, is the new Cross kerosene. This new fuel is a departure from any kerosene previously manufactured by the Shell Company, and is specially prepared to meet every requirement and every class of work carried out by the tractor owner to-day.

"Agricultural Bias"—Trying out the Lads.

Boys may have the makings of successful farmers, but in the first place they require the opportunity to learn whether they are suited to the work, and whether the work is likely to make a permanent appeal to them. To this end, it is desirable that the boys should have first-hand experience, and a week or so on a farm, although short, would be to better purpose than any quantity of talk. The Canterbury Rural Vocational League appreciates this, and the camp that has been arranged by the league for Christchurch boys is the first practical step that has been taken. This opportunity will enable a few perhaps to decide whether they have a natural "agricultural bias."—Christchurch "Sun."

None but the Best.

It is, in the end, to the maker of the best butter, either Danish or New Zealand, that the public will turn, and in the same way it is to the reliable worker, willing to do rather more than his fair share of the labour—who gives of his best—that the rewards of industry will be accorded. "None but the best" would be a powerful slogan to ally with New Zealand produce for the overseas market if it were substantiated in fair season and in foul by the proof that it is no idle boast, and "nothing but the best" might be applied with equal force as the motto of the worker in the wool-shed, the factory, or the office chair, who is aware of his duty to himself, no less than to his employer and the State, to do his work well at all times, no matter how irksome the task may be.—"Otago Daily Times."

What Rationalisation Means.

This definition of rationalisation, a new term of commercial jargon of the day, is interesting:—"Rationalisation to me means an honest reasonableness and foresight in the conduct of the business which I, with my fellow workers, am engaged in," says Mr. Launcelot E. Smith, C.B.E., in "Modern Transport." "A workman who has to waste time in hunting for his tools, or a workman whose tools are inefficient or out of date, is sheer waste. Taking this simple case as an analogy, and applying it to the business as a whole, it follows that a rationalised business means that kind of a business in which throughout the greatest orderliness prevails, handiness in every department and in every sense from top to bottom, and a carefully reasoned anticipation of coming changes, with the courage of conviction to prepare for them."

A Blessing on Wheels.

"Difficulties of housing and social contentment are being solved by the car. The charabanc, to which many people have taken such violent exception, has been the instrument of more industrial goodwill, more education, and more happiness than all the lectures, soup kitchens, and free legal advice ever afforded to a long-suffering public. Let us encourage comfort and avoid waste of physical energy by every means known to science. The motor-car is the best of all weapons for this purpose. Does anyone grudge the educational possibilities of the motor tour to young people, who have far more to learn than their grand-parents in a much shorter space of time? The motor-car is the poor man's yacht, magic carpet, Riviera, and school all rolled into one at the cost of a little monthly economy to the benefit of a highly successful British industry."—Professor A. M. Low, in the "Sunday Dispatch."

Readers are reminded that a cross in the prescribed square on the first page of this "Journal" is an indication that their Subscription —one shilling—for the current year is now due. The "Journal" is free to farmers and the shilling is merely to cover the cost of postage for twelve months. If your copy is marked with a cross please renew your registration now. Fill in the order form on another page of this issue and mail it immediately, with postage stamps or postal note for one shilling, to the Under Secretary, Department of Agriculture and Stock, Brisbane.

The Home and the Garden.

MOTHER AND CHILD.

DAME JANET CAMPBELL'S REPORT.

The protection of motherhood and the safeguarding of the infant and the little child is of the first importance to every country, but especially to Australia with her scattered population and wide distances.

The protection of maternity and infancy is a relatively new branch of public health and social service, but its importance is being rapidly realised.

In reviewing the maternal and child welfare work in Australia, the impression is gained that the time has arrived when effective development depends upon securing an agreed policy and direction with a view to economy of effort, time and money, together with special attention to certain aspects of training, organisation and education, in order that the work as a whole may be rendered fully efficient, more scientific, and not unduly dependent upon the goodwill, enthusiasm and generosity of individuals, and, perhaps most important of all, that it shall take its proper place in organic relationship with all other branches of established public health work.—Dame Janet Campbell.

THE report on maternal and child welfare in Australia by Dame Janet Campbell, D.B.E., M.D., M.Sc., (Senior Medical Officer for Maternity and Child Welfare, Ministry of Health, London) who last year visited Australia, has been issued by the Commonwealth Department of Health. Dame Janet says, inter alia:—

For Australia as a whole the total maternal death rate in 1928 was 5.98, that is, approximately six mothers died for every thousand babies born alive; this is not only a rate which is excessive in itself, but it is the highest rate on record during the period under review. The lowest figure reached was 4.27 in 1915, which was not a normal year, and since 1922 the death rate shows a steady and almost uninterrupted rise—a circumstance which must cause considerable anxiety and disquietude.

Of the causes of death at the time of childbirth, puerperal sepsis, which should be to a great extent preventable, is the most important. It accounts for 2.335—nearly one-third of the deaths in Australia—and 11,569 deaths in England and Wales, which represents a rather higher proportion.

Nature Aids.

The visitor to Australia forms a very favourable impression of the domestic and social circumstances of the people from the point of view of health and hygiene. The climate is, on the whole, excellent and such as to encourage a wholesome open-air life; there is abundance of sunlight, and, if the heat is excessive during the summer months, there is little of the unpleasant cold, damp weather which is apt to be so productive of illness, and there is still less of continued cold or frost even in the southern areas. There are ample opportunities for open-air exercise, games, and sports; the housing is good; there are no tenements and no slums in the English sense of the term, though housing conditions may not be wholly satisfactory in certain districts in the large cities. The average standard of living is high, and there is little evidence of poverty, although at the present time there is, temporarily, considerable unemployment. There are few, if any, congested areas of population. All of which make for healthy infancy as well as healthy adult life.

Improved Education.

The safety of the mother and infant must ultimately depend upon the skill and knowledge of the professional attendant, whether doctor or midwife. It is generally agreed that the education of the medical student and pupil midwife should equip them adequately for all duties which they may be called upon to undertake; much has been done to ensure this, but even yet the training is not wholly satisfactory

and stands in urgent need of further improvement. The action of the Universities of Sydney and Melbourne in creating Professorships of Obstetrics indicates the increased importance attached to midwifery, and is the first step towards much needed reforms in the curriculum. Some experience of domicilliary midwifery is a valuable and indeed a necessary part of the training, but it should come after an effective grounding in hospital practice and should be under the direct control of the teachers responsible for the midwifery course.

It is also most desirable that careful attention should be given to the care and hygiene of the new-born infant, including the management of breast feeding and the initial difficulties which may need to be overcome in regard to this; also in the care of the premature or weakly infant, &c. Although the midwifery nurse will undertake the actual handling of the infant, it is desirable that this shall not be left wholly to her knowledge and discretion as has too often happened in the past, but that the doctor shall assume ultimate responsibility and shall be properly equipped by his own training for so doing.

Training in Mothercraft.

It is most desirable that training in mothercraft shall receive full official recognition and support. In order to secure a uniformly high tradition and standard of instruction and to prevent the setting up of a number of small training schools, which cannot offer full teaching facilities, general regulations might well be made to which all approved mothercraft schools should be expected to conform; for example, as regards the accommodation, equipment, facilities for teaching, qualifications and experience of the staff, length of the training period, admission of trainees, &c., while the whole of the course should be under medical direction and control; but due latitude should be left to those responsible for the course in each institution to modify or vary the detailed methods taught.

Diversity of medical opinion and practice in regard to infant feeding in Australia and elsewhere indicates that there can be no one stereotyped or standard method applicable to every infant under all circumstances, and suggests that the ordinary baby is tolerant of, and can even thrive upon, comparatively widely different dietaries. Moreover, differences in local conditions, customs, climate, &c., in themselves make some modification necessary. Therefore, while the general organisation of the mothercraft school should be such as to ensure adequate training, room should be left for individual difference of opinion in the detail of instruction.

Effective Supervision.

A maternity service comprising arrangements by which any woman can obtain such necessary facilities as she requires for the satisfactory conduct of a normal or a difficult confinement when she is unable to provide all or any of these facilities for herself is the ideal to be aimed at in every district.

The establishment of public pre-natal (ante-natal) clinics is needed to which patients may come for advice and to which doctors may be able to refer their patients for consultation or a second opinion.

The obvious nucleus for such clinics is the service already established at the maternity hospitals. Although all of these are not as yet equipped and staffed to meet the full requirements of the pre-natal clinic, it should not be difficult to enlarge and extend their scope sufficiently to do so. They have the great advantage of being under the control of a specialist medical staff assisted by trained midwifery nurses, and their professional status is such that they can properly be used for consultative purposes; they are not in a position to meet the needs of women living at some distance who do not wish to engage the services of the hospital for the confinement, but there seems no reason why branch clinics based on the hospital should not be established where necessary with the assistance of the Health Department.

The alternative would seem to be the establishment of independent pre-natal clinics at the infant welfare centres as part of the maternity and child welfare organisation; but if this were done, although the centre premises and the services of the nurses might appropriately be made use of, there would probably be great advantage in arranging for the maternity hospital to be responsible for the medical consultations so that the high quality of the advice given might be ensured and also close association with an institution to which an abnormal case could be referred when necessary for treatment.

There are certain disadvantages in the ad hoc pre-natal clinic. For example, there is often difficulty in securing the medical service of practitioners fully conversant with ante-natal methods and able to give sound obstetric advice; there is the further disadvantage that the medical officer of such a clinic is necessarily in a somewhat

detached position and rarely sees the termination of the pregnancy or is able to control accurately the conclusions which he has formed, as, although interchange of opinion between the clinic medical officer and the attendant at the confinement should be full and free, it is not always easy to maintain this in practice. Association between the hospital on the one hand and the centre on the other with its facilities for home visiting and education in hygiene and mothercraft would seem likely to yield the best results.

Community and Intermediate Hospitals.

There is already an evident desire on the part of patients who are not eligible for the maternity wards of the public hospital for a share in the advantages obtainable in a large and well-managed maternity hospital. The establishment of wards for ''intermediate'' patients would seem to be eminently desirable and would enable many women, able to pay reasonable medical and nursing fees, to have their babies under fully satisfactory conditions, instead of risking infection or other dangers in an ill-equipped private hospital.

Friendly inquiry at the ante-natal clinic or by a visiting nurse may bring to light various ways in which an expectant mother may need assistance—the provision of domestic help, for example, or the addition of fresh milk or vegetables to an unduly limited dietary, or convalescent or after-care treatment. Many voluntary associations are in a position to supply such needs and an endeavour should be made to put the woman in touch with the appropriate agency, either directly or through the almoner's department of the hospital when this exists.

Voluntary Societies.

Although the circumstances in Australia are not altogether parallel with those in England, it is difficult to escape the conclusion that sooner or later the work of the voluntary societies will come to a much greater extent under the supervision of an official authority which will be responsible for the general policy followed and for much of the cost of maintenance; and, while leaving reasonable freedom to the organisations to carry on and even extend the work of centres which they have founded, will establish new centres in areas where voluntary effort has not made itself evident, and provide such facilities as are practicable in districts too thinly populated to be served by centres in the ordinary way.

This would have the further advantage of encouraging greater co-operation among voluntary workers than exists at present. One cannot fail to be deeply impressed with the large number of voluntary societies which are in existence and which represent an immense volume of willing and devoted service, self-sacrifice, and generosity; but many of these societies are concerned with slightly different aspects of the same large issue, and independent effort involves unavoidable overlapping of work; there may even be two active societies doing similar work in the same district in a somewhat competitive spirit which not only does not make for the best results but is confusing to the general public, and may thus tend to damage the cause which all societies have so much at heart. Greater co-operation and unity of effort could not fail to be productive of economy of time and money and would enable the work to be done more effectively and successfully.

In Australia the local authority is often too small or the district too thinly populated to be entrusted suitably with much, if any, special maternal and child welfare work, and it is necessary for the State not only to decide upon the policy to be followed but also very largely to carry it out. This situation would seem to make it even more necessary to establish in each State a properly organised Division of Maternal, Infant, and Child Welfare as a branch of the Health Department in charge of a whole-time medical director responsible to the Chief Medical Officer of Health, before any general scheme or policy could become practicable.

Influence of Women's Organisations.

In order to carry through successfully any comprehensive scheme for social and health reform it is necessary to secure the active support of an informed public opinion. Questions relating to maternal and child welfare are of peculiar importance to women, who, after all, are in a position to appreciate most directly the disabilities, suffering, and even hardships which may be associated with maternity. Therefore, if the interest of the women of the country can be aroused one may look to them to produce the splendid driving force which is inherent in a sound and enlightened public opinion.

Women are still perhaps too patient and forbearing, and they do not as a whole fully appreciate as yet how much might be done to relieve the housewife of some of her burdens or to protect her physical health, but it is to women's organisations that we may look with confidence, not only to show every woman what might be done, but to persuade the community in general of the wisdom and practicability of the course they advocate, and so create that intelligent backing which is necessary to translate theories into action. Women's organisations have already done much to call attention to this matter—both those which are primarily concerned therewith, such as the Standing Committee for the Reduction of Maternal and Infant Mortality, and those—such as the National Council of Women—which fully recognise its importance though they are also engaged in considering other problems of social interest.

Research.

The study of maternal mortality and morbidity and of sickness and death during infancy is only in its beginnings, and although we can do much through administrative and medical measures to prevent and reduce the present loss of life and health, further knowledge is essential for satisfactory progress in order that the soundness of our methods may be tested by the results of scientific and organised research.

The measures so far discussed are concerned with maternal and child welfare, mainly in its local and routine aspects; a wider vision is also necessary. It is fully recognised that the organisation suggested for each State is beyond the present resources of some States, and it was no doubt in order to meet difficulties of this kind that the Royal Commission on Health recommended that the Commonwealth Government should assume some degree of active responsibility. Much could be said in favour of this policy; indeed, it is difficult to conceive of any aspect of human interests which is, or should be, the business of the whole nation more than that of Motherhood. The fundamental impulse of sympathy for the woman about to face her hour of trial is universal and needs no emphasis, and it is believed that this concern for the protection and wellbeing of the mother, rather than obvious economic national interests, moved the Fisher Government to pass the Maternity Allowance Act in 1912.

Commonwealth Responsibility.

The Commonwealth Government has thus become committed, and no departure from established policy would seem to be involved in a more definite participation in the common duty. The suggestion that something of this kind should be done would, I am convinced, evoke instant response from the people of all Australia, and, indeed, anything less than a simultaneous impulse throughout the Commonwealth under a united national inspiration would be inadequate to secure the change necessary to put into practice proposals involving the harmonious readjustment of so many administrative and personal relationships. A national centre is essential for the collection of information, for the examination of problems on a national scale, for investigation of work being done by the State authorities and the publication of comparative results, for the encouragement of research, and, should the Commonwealth Government adopt the policy of subsidising activities in this field, for providing expert advice in relation to such subsidies.

IN THE KITCHEN.

Prunes can be used in a variety of forms. The following suggestions are taken from a collection of fifty attractive recipes, supplied by Miss A. E. Millenet to the Fruit Branch of the Department of Agriculture:—

Prune and Tomato Conserve.—One quart tomato pulp, one cup prune pulp, four cups sugar, one lemon cut in small pieces, half-cup chopped walnuts. Cook all ingredients together until thick and clear, put into small glass jars and seal when cold.

Prune and Rhubarb Preserve.—Three pounds rhubarb cut in small pieces, 2 lb. sugar, 1 lb. cooked prunes, three lemons (juice and grated rind). Mix all the ingredients together and cook very slowly until thick, put in glass jars, and seal when cold.

Prune Conserve.—One pound prunes (soak all night in one pint of water), one orange (slice and soak in half-pint of water), one cup brown sugar, one cup seeded raisins, juice of one lemon, half-cup of chopped nuts. Drain the prunes, stone and

return to the water, add the orange, raisins, and lemon juice, and cook very slowly until the fruit is perfectly tender, about half an hour. Add the sugar and nuts, and simmer again until thick.

Prune Chutney.—One and a-half pounds of prunes, 4 oz. sultanas, ¾ lb. onions, 2 oz. brown sugar, 2 pints vinegar, 1½ oz. salt, four tablespoons treacle, half teaspoon each of mace, cinnamon, and spice, a little preserved ginger, a tiny clove of garlic, Worcestershire sauce and cayenne to taste. Mix all together and boil gently until tender.

Prune and Pineapple Pie.—Mix one cup of prune pulp with one cup of shredded pineapple, half-cup sugar, one tablespoon of lemon juice, and a pinch of salt. Bake in a pie plate lined with pastry for twenty minutes in a hot oven, cool, and cover with whipped cream or a meringue made from the whipped whites of two eggs, four tablespoons of sugar, and half a teaspoon of rose water.

Prune Sandwiches.—One oz. walnuts, 1 oz. dates, 4 oz. softened prunes, one tablespoon golden syrup, one tablespoon lemon juice. Stone the fruits and mince finely. Chop the nuts finely and mix with the fruit, add the syrup and lemon juice. Use between slices of plain cake or brown bread and butter.

Banana Puddings and Pastries.

Make a nice short crust of 6 oz. of dripping to 10 oz. of flour, a little salt, a squeeze of lemon juice or vinegar, no baking powder is needed, make to a nice firm dough and roll once only; the more nimble you are at the preparation of this, once you have started, the crisper will be the pastry. The bananas should be peeled ready, with a few drops of lemon juice sprinkled over them or not, as you choose, cut out your pastry, and wrap each whole fruit in a piece, pinch in well at each end, and bake in a good oven for twenty minutes. This may be served with a custard, baked, or boiled, or with cream, or just milk, or may be eaten cold. The children just love them cold for school tucker bag.

Banana Tart.

Method: (1) Peel and cut bananas into rounds. (2) Place in a pie-dish. (3) Add grated rind and juice of lemon. (4) Add sugar and water. (5) Cover with short pastry. (6) Bake in a hot oven for twenty minutes.

Materials.—Six bananas, one lemon, 2 oz. sugar, one teacup water, enough crust to cover the pie-dish.

Banana Trifle.

Six bananas, one orange, half lemon, six sponge cakes, strawberry jam, ½ pint of good custard, ½ pint of cream, ½ oz. of Pistachio nuts. Peel the bananas and cut them into quarters lengthways, slice the cakes thinly, spread each piece with jam. Peel the orange and lemon, cut into small dice, taking out all pips. Grate the lemon rind. Put a layer of the cakes into a glass dish; put on them a spoonful or two of custard, next a layer of bananas and few pieces of orange and lemon and grated rind. Continue this till the dish is full. Put whipped cream on top; shell and shred the nuts and stick them in rows over the cream. Serve as cold as possible.

MARKET GARDENING.

SWEDE TURNIP.

Although considered a farm crop suited to the needs of stock, swede turnips, when taken at the proper stage, form a welcome addition to the list of vegetables that may be considered as profitable to grow.

Turnips thrive under identical conditions of soil and climate, but swedes can safely be thinned out to greater distances, whilst the distances apart of the drills require to be somewhat greater. Swedes lend themselves to storage where such is desired, but this should be undertaken only where a favourable situation is procurable.

Sow in early autumn. The varieties recommended are—Elephant or Monarch; Champion Purple Top; Laing's Garden Swede.

TOMATOES.

A rich friable, or sandy loam is necessary where heavy crops are desired, but at the same time early yields may be obtained from comparatively poor and medium quality land. The preparation of land as previously mentioned for onions may be applied to this crop.

Seed should be sown during early spring and summer in shallow boxes, and covered with a fine sprinkling of loamy soil, which should be kept moderately moist. When the plants are sufficiently strong they may be transplanted out into their permanent positions, care being taken that they be planted slightly deeper in order that the roots may be able to better assimilate soil-moisture. Plants should be placed not less than 2 ft. apart with a space of 4 ft. between the rows.

Special treatment and training are required for the production of large sized fruit.

Where practicable, the vines should be trained to trellises about 5 ft. high. When allowed to spread on the ground a large proportion of the fruit is lost through rotting during rainy weather. Heavy mulching of the surface is of value, particularly in dry districts.

It may be impossible on large areas to erect the necessary trellising, but an effort should be made to keep the vines off the ground and allow sunlight and air free play through the foliage.

Tomato plants are susceptible to various diseases, which are difficult to keep in check. Experience has proved that a moderate and regular supply of water develops less rotten fruit than lightly or heavily watered plants; frequent aeration of the soil by cultivation is necessary during the growing period. Exposure to the sun also tends to increase disease, and methods of growth that will allow the foliage to shade the fruit assist in checking this.

When carrying a heavy crop it is advisable to apply liquid manure occasionally and if possible mulch the plants. Liquid manure is best applied just before the flowering period.

Burn all fruit showing signs of disease.

Varieties recommended are—Chalk's Early Jewel; Burwood Prize: Hurst's Buckeye; Spark's Earliana; Trucker's Favourite.

TURNIPS.

To obtain a good crop of this useful vegetable, it is necessary that rapid growth be made, therefore rich soil and an open situation are of main importance. The seed should be sown thinly in drills and the plants hoed out to the proper distance apart when young. In cool climates sowings may be made nearly the whole year, but in hot, dry districts, late summer and autumn sowings are recommended. Spring sowings should be limited, as the plant soon runs to seed. Turnips are frequently attacked by aphis, which, if not checked, spreads with alarming rapidity and will soon exterminate the whole crop. Kerosene emulsion or a strong solution of tobacco water will usually effectively deal with this pest, if applied in the early stages. Cabbage-fly, which also attacks turnips in warm weather, may be kept in check by an application of a solution of Paris green, care being taken that this remedy is used only on the immature plants.

The varieties most used are—Purple Top Milan, White Milan, White Stone or Snowball, Red American Stone, and Orange Jelly.

(TO BE CONTINUED.)

A VALUABLE JOURNAL.

Renewing his subscription to the Journal, a Yandina farmer writes (14*th January*, 1930):—"*. . . . I thank you for the past year's issue and I assure you it's a very valuable journal to me, and I appreciate the amount of work put into it. . . . .*"

Orchard Notes for April.

THE COASTAL DISTRICTS.

In the Orchard Notes for March the attention of citrus growers was called to the necessity of their taking the greatest possible care in the gathering, handling, sweating, grading, and packing of the coming crop of fruit, as the returns for the labour expended in the upkeep of their orchards will depend entirely on the condition in which the fruit reaches the market. Many growers fail to realise the very important fact that the success of fruitgrowing does not depend merely on the proper working and management of the orchard, so essential for the production of a good crop of high-class fruit, but that the manner in which the fruit is handled and placed on the market is of even greater importance. In no branch of fruit culture is this more evident than in the case of citrus fruits, as no fruit pays better for the extra care and attention necessary to enable it to be marketed in the best possible condition. Every season there is more or less loss in the consignments sent to the Southern markets, the percentage depending mainly on the weather conditions, the loss in a wet year being much heavier than that in a dry year.

A very large percentage of the loss is due to what is known in the trade as specking—viz., a rotting of the fruit caused by a mould fungus, and this loss can be prevented, provided necessary precautions are taken. Although this matter was dealt with last month, it is of such vital importance to our citrus growers that it is necessary to again refer to it.

In the first place, growers must clearly understand that specking cannot occur on perfect fruit, the skin of which is free from injury of any kind. The fungus causing specking can only obtain an entry into the fruit through an injury to the skin; it will thus be seen that the remedy for specking is to take every possible care not to injure the skin of the fruit in any way.

Few growers realise how easily the skin of citrus fruits is injured, especially that of fruit grown under moist and humid conditions, when the skin is full of moisture and so tender that the least sign of rough handling causes serious injury, as the cells of the skin are so brittle that they are easily broken, and when so broken a ready means of entry for the mould fungus is provided, and specking follows in due course.

The remedy for specking is in the hands of the grower, who must learn so to gather, handle, and transport the fruit from the orchard to the packing-shed that it does not receive the slightest injury, and further, that when it has reached the packing-shed it must be carefully placed in shallow bins or on trays and be exposed to the air for at least seven days, so that the surplus moisture in the skin may be removed, and the skin thus becomes toughened and less easily injured. This drying of the skin is known as "sweating," and during the time the fruit is being sweated it should be kept under observation, and all fruit showing signs of specking or injury from fruit flies, sucking or boring insects, mechanical injury or bruising, should be removed.

In order to prevent injuring the skin when gathering, all fruit must be cut and not pulled. Gloves should be used to handle the fruit, and when cut it should be placed in padded baskets or other suitable receptacles. Any fruit that falls or is injured in any way should be rejected, as it is not fit to send to a distant market. At the same time, if the injury is only slight, it can be sent to a local market for quick sale.

For Southern markets only perfect fruit should be selected, and further, it must be graded for size, colour, and quality, and properly packed, only one grade of fruit being packed in a case. The cost of cases, freight, and marketing is now so high that only the best fruit will pay to send to the Southern States, and even the best fruit must be properly graded and packed in order to produce the best returns.

All orchards, vineyards, and plantations not thoroughly clean should receive immediate attention, as from now till the next rainy season the ground must be kept in a thorough state of tilth and free from weeds in order, in the first place, to retain moisture in the soil, and, in the second, to enable birds, ants, and predaceous insects to get at and destroy the pupæ of fruit flies and other pests harbouring in the soil.

Banana and pineapple plantations must be put into good order, and kept free from weed growth.

Land to be planted with trees should be got ready, as, if possible, it is always advisable to allow newly cleared land time to sweeten before planting.

Farm Notes for April.

FIELD.—Those areas already lying in fallow for subsequent sowing with wheat should be kept in good tilth, using field implements that have a stirring effect in preference to those which tend to reverse the surface soil. The surface should never be allowed to cake; consequently all showers must be followed by cultivation, as soon as conditions will permit of teams and implements working freely.

Early fodder crops, such as barley (skinless or Cape) and certain varieties of wheat may be sown during April. Growers of winter fodders will be well advised to study the article dealing with dairy fodder plots which appeared in February, 1922, Journal.

Potatoes should now be showing good growth and must be kept free from all weed growths by means of the scuffler. If sufficiently advanced, and any doubt exists as to the prevalence of blight, advantage should be taken of fine weather to give a second spraying of ''burgundy mixture,'' a calm and somewhat cloudy day being chosen if possible for the spraying.

Where land has been previously well prepared, lucerne sowing should be carried out this month, and intending growers of this fodder will be well advised to ascertain the germinating qualities of seed submitted to them for purchase. The difference between a good and bad ''strike'' is often traceable to the poor class of seed sown.

Maize and cotton crops should now be in the harvesting stage, and, once matured, are better in the barn than the open paddock, where weevils and other insects are usually prevalent at this season of the year.

Root crops sown last month should now be making fair growth, and during the early period of such should be kept free from weeds, and where necessary, thinned out. Sowings of mangels, swedes, field carrots, sugar-beet, and rape may still be made where conditions of moisture will permit.

As the sowing season is close at hand for certain varieties of wheat—i.e., those which require a fairly long period to develop in, every effort should be made to bring the seedbed into the best possible tilth and to free it from foreign growths of all kinds. The grading of all seed-wheat is strongly recommended, and growers who favour certain varieties should adopt a system of seed selection from prolific strains with a view to the raising of larger quantities of pure typical grain for ultimately sowing in their larger fields.

Pickling of wheat to prevent smut (bunt) is necessary. Germination tests should be carried out prior to commencing seeding operations.

Sorghums which have matured and are not immediately required as green fodder should, wherever possible, be conserved as ensilage to provide for a reserve, to tide over the period when grasses and herbage are dry. Succulent fodder of this description is the best possible form of insurance against drought, and for maintaining dairy and other stock in thrifty condition.

THE CONTENTED SPIRIT.

If you will secure a contented spirit you must measure your desires by your fortune and condition, not your fortunes by your desire; that is, to be governed by your needs, not by your fancy; by Nature, not by evil customs and ambitious principles. He that would shoot an arrow out of a plough, or hunt a hare with an elephant, is not unfortunate in missing the mark or prey, but he is foolish for choosing such unapt instruments; and so is he that runs after his content with appetites not springing from natural need, but from artificial, phantastical, and violent necessities. These are not to be satisfied; or, if they were, a man hath chosen an evil instrument towards his content. Nature did not intend rest to a man by filling of such desires. Is that beast better that hath two or three mountains to graze on, than a little bee that feeds on dew or manna and lives upon what falls every morning from the storehouse of Heaven, clouds and providence? Can a man quench his thirst better out of a river than a full urn, or drink better from the fountain when it is finely paved with marble, than when it swells over the green turf? Pride and artificial gluttonies do but adulterate Nature, making our diet healthless, our appetites impatient and insatiable, and the taste mixed, phantastical, and meretricious. But that which we miscall poverty is indeed Nature; and its proportions are the just measures of a man, and the best instruments of content. —Jeremy Taylor.

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY D. EGLINTON, F.R.A.S., AND A. C. EGLINTON.

TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

	March, 1930.		April, 1930.		MOONRISE Mar., 1930.	MOONRISE April, 1930.
Date.	Rises.	Sets.	Rises.	Sets.	Rises.	Rises.
1	5.48	6.23	6.5	5.46	a.m. 5 57	a.m. 7.34
2	5.48	6.22	6 5	5 45	6 50	8.33
3	5 49	6 21	6 6	5.44	7.46	9.38
4	5.49	6 20	6 6	5.43	8 42	10 41
5	5 50	6.18	6 7	5 42	9.40	11.45
6	5.50	6 17	6.7	5 41	10.41	p.m. 12.47
7	5 51	6.16	6.8	5.40	11 45	1.45
8	5.51	6.15	6.8	5.39	p.m. 12 48	2.37
9	5.52	6 14	6 9	5 38	1 51	3 21
10	5 52	6.13	6 10	5.37	2 54	3 58
11	5 53	6.12	6 10	5 36	3 52	4.43
12	5.54	6.10	6 11	5.34	4 43	5.7
13	5 54	6 9	6 11	5 33	5.24	5 39
14	5.55	6 8	6 12	5 32	6 2	6.14
15	5 56	6.7	6.12	5 31	6 36	6.50
16	5 56	6 6	6.13	5.30	7.10	7.30
17	5 57	6 5	6 13	5.29	7 44	8.17
18	5 57	6 4	6.14	5.28	8 18	9.7
19	5 58	6.3	6.14	5 27	8 55	9.59
20	5.58	6 2	6.15	5 26	9.39	10.56
21	5.58	6.1	6.15	5.26	10.27	11.51
22	5 59	6 0	6 16	5.25	11.17	...
23	5.59	5 59	6 16	5.24	...	a.m. 12.45
24	6.0	5.58	6.17	5.23	a.m. 12.11	1.39
25	6 0	5.56	6.17	5.22	1.5	2.34
26	6 1	5.55	6.18	5.21	1 57	3.29
27	6 1	5.54	6.18	5 21	2.54	4.25
28	6.2	5.52	6.19	5.20	3.50	5.23
29	6 2	5.50	6.19	5.19	4.46	6.23
30	6.3	5.48	6.20	5.18	5.40	7.26
31	6.4	5.46	...	...	6.35	...

Phases of the Moon, Occultations, &c.

8 Mar.	☾	First Quarter	2 0	p.m.
15 ,,	○	Full Moon	4 58	a.m.
22 ,,	☽	Last Quarter	1 12	p.m.
30 ,,	●	New Moon	3 46	p.m.

Perigee, 13th March, at 6·24 a.m.
Apogee, 25th March, at 3·24 a.m.

It will be interesting to notice the near approach of Jupiter to the Moon on the 7th, before they set, about 10·15 p.m. The nearest apparent approach in the line of sight will be at midnight, when they are below the horizon.

The occultation of Iota Geminorum (magnitude 3·8) will occur shortly after 6 p.m. on the 10th. It will last longest (about an hour and a-half) at places 33 degrees south, and the star will remain hidden by the Moon longer in the south of Queensland than in the north. The time at Cairns will be reduced to about one-half. Four hours later another star in Gemini (magnitude 4·9) will be occulted for a longer period in northern Queensland.

Mercury will rise at 4·2 a.m. on the 1st, and at 4·45 a.m. on the 15th.

Venus will rise so soon (21 minutes on the 1st and 31 minutes on the 15th) before the Sun, as to be lost in his rays.

Mars will rise at 4·4 a.m. on the 1st, and at 4·27 a.m. on the 15th.

Jupiter will set at 11·28 p.m. on the 1st, and at 10·4 p.m. on the 15th.

Saturn will rise at 1·11 a.m. on the 1st, and at 12·11 a.m. on the 15th of March.

On the 21st, at 10 p.m. the Sun will reach the junction of the ecliptic and the celestial equator—the First Point of Aries and the point on the horizon at which it sets will be due west.

When the Moon rises on the 28th, it will be seen to have passed to the eastern side of the planet Mars, about three hours earlier.

The occultation of Venus by the Moon on the 31st will, unfortunately, be invisible, on account of their nearness to the Sun.

6 April	☾	First Quarter	9 24	p.m.
13 ,,	○	Full Moon	3 48	p.m.
21 ,,	☽	Last Quarter	8 8	a.m.
29 ,,	●	New Moon	5 8	a.m.

Perigee, 9th April, at 9.12 p.m.
Apogee, 21st April, at 10·54 p.m.

On 1st April Mercury and Uranus, on the far side of their orbits, will be almost in a line with the Sun, but not exactly behind it. They will both be on its southern side, Uranus at a distance of one diameter of the Moon and Mercury at double that distance. Mercury will be passing eastward of the Sun but Uranus will be left on the western side.

The Moon will be passing Jupiter at midday on the 4th, when it will be interesting to look for the planet with binoculars at a distance of 4 degrees, or eight times the diameter of the Moon to the southward.

For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S., add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhat about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

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QUEENSLAND AGRICULTURAL JOURNAL

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Event and Comment.

Queensland Wheat.

QUEENSLAND has harvested her 1929 wheat crop and the deliveries of grain to the State Wheat Pool are practically completed. The result of the crop as a whole is highly gratifying. We are now faced with early preparations for the 1930 harvest.

In a recent report to the Minister of Agriculture and Stock, Mr. Harry F. Walker, the Director of Agriculture, Mr. H. C. Quodling, calls attention to the fact that within the Darling Downs and Maranoa districts, the recognised wheat belt of this State, considerable areas of land are lying idle which could be brought under grain production.

This State for the next few years has little to fear from over-production of wheat, for we are as yet far behind in our own requirements which approximate 5,000,000 bushels yearly. It is generally an uneconomic policy to buy from our neighbours that which we are capable of producing ourselves, but for years past this is what Queensland has been doing in order to supply her requirements in a class of grain which she can produce equal in quality to that of any other State in the Commonwealth.

Although wheat production is not at present Queensland's main rural industry, wheat is a primary product to which more attention could be given for the general welfare of the community. In this State, it is customary for the most progressive wheatgrowers who apply approved methods of cultivation, to commence summer fallowing operations immediately following on the previous harvest, and already most of these growers have made considerable progress in this direction. It is, however,

to a small minority who have as yet made no efforts in the direction of preparing their land that the advice to get busy has been tendered.

From a long series of experimental trials conducted by the officers of the Department of Agriculture, it has been shown that to attain success in wheatgrowing under average Queensland conditions, it is essential that early initial cultivation of areas intended for wheat should be carried out, or at least very far advanced, before the rainy season begins. The copious rainfall usually experienced between the months of December and April is thus more readily absorbed instead of being diverted or else almost entirely lost where compacted soil surfaces are existent.

On our black soils of the Darling Downs rain has the effect of rapidly breaking down and rendering friable a soil which, under dry conditions, is difficult to cultivate, but the use of improved implements and power has facilitated early and rapid cultivation and completely changed the old order of things. Once the fallows have received the benefit of good rains they should be worked immediately conditions permit. This practice controls weed and volunteer growths, and tends to create the soil mulch absolutely necessary where moisture is to be conserved.

Wheat favours a firm seed-bed and the first 4 inches of cultivated soil is that from which it largely draws its substance. Given a retentive sub-surface, in which the moisture has been conserved by a well-worked mulch, the wheat plant will carry on to maturity with the aid of occasional showers. Early and efficient cultural methods, combined with the selection of proved satisfactory varieties of wheat and seasonable sowing, are important factors in successful grain production; the rest can very safely be left to ordinary seasonal conditions.

Our Cotton Future.

AS has been previously indicated in statements which have been made on behalf of the Government since its assumption of office, very careful consideration has been given to the future of the cotton industry. An exhaustive examination has been made of the present position of the industry and of its future prospects. It has been ascertained that the yield per acre compares more than favourably with the yield per acre in the United States. The average quality of Queensland cotton is superior to that of the American crop, its average value being at least 85 points above American middling. The cost of production in Queensland also compares very favourably with that in the United States. The two directions in which the Queensland cotton growing industry has been handicapped, however, are in the cost of picking and the cost of ginning.

During the period of its establishment the industry has been assisted by Government guarantees and bounties, and it is obvious that such bounties cannot continue indefinitely. It has been found necessary, therefore, to devise means which will enable the industry to stand on its own feet under the protection of a tariff. A further bounty period may be necessary, but it is the desire of the Government to so arrange that during the remainder of the present bounty term readjustments will be made which will enable the industry to so reduce costs as to permit of its being carried on on a proper economic footing.

The ginning and oil milling have so far been carried out by the British Australian Cotton Association. As is generally known, this concern established six ginneries at several centres in Queensland and also an oil mill at Whinstanes, near Brisbane, the capitalisation of the concern being in the region of £560,000 Unfortunately, some of the ginneries were erected in wrong locations. A large amount of money was spent by the concern in the initial stages on other than fixed assets, and generally the ginning rate of 1¼d. per lb., which it has been necessary for the company to charge the growers, has been an onerous burden on the industry. Such a ginning rate is very much in excess of the charge which obtains in the United States; and this excess charge accounts partially for the necessity which the growers

have been under in asking for a continuance of Commonwealth bounties. A further important point concerns the efficiency of the Queensland ginneries in comparison with modern ginneries operating in America. An extensive development has taken place in recent years there in connection with the handling and cleaning of seed cotton prior to ginning, and the absence of this cleaning and handling equipment in the Queensland ginneries so operates as to necessitate unnecessarily fine picking in the Queensland cotton fields, which factor accounts for some of the excess cost in this phase of the industry. This handicap is being carried by the industry in addition to the burden of over-capitalisation of the ginneries and oil mill plant.

With the object of easing these burdens on the grower and placing the industry on a co-operative basis, the Cotton Board entered into negotiations with the Cotton Association for the acquisition of its physical assets in Queensland. The negotiations culminated in an agreement between the parties concerned by which the Board takes over the ginneries and oil mills at a valuation mutually agreed upon.

Commenting on this development recently, the Minister of Agriculture and Stock, Mr. Walker, said that the reconstruction of the ginneries and oil mills and the cheapening of the cost of picking and ginning which have been handicapping the industry, were necessary preliminaries to the carrying out of further important policies which the Government had formulated for its development. He forecast further Federal and State action towards stabilising the industry, and of establishing it firmly as one of our staple rural enterprises.

Questioned as to what his opinion was with regard to the extent of land available in the State for increased cotton production, Mr. Walker quoted from a report on the subject which he had called for from the chairman of the Land Administration Board (Mr. W. L. Payne), and which is summarised as follows:—

> In the opinion of the Land Administration Board, if prices were stabilised over a period of years at a figure that would make cotton growing a payable proposition, greatly increased production of cotton in Queensland would immediately result.
>
> Apart altogether from the question of new land settlement, there is at the present time in Queensland an immense area of land held under selection tenures which is eminently suited for the production of cotton. Evidence given before this Board in its various investigations establishes clearly that if the prices were stabilised at a rate attractive to growers, the production of cotton in Queensland would be increased at least tenfold. Everything depends on the stabilised rate being satisfactory and being applicable for several years in succession.
>
> It is pointed out that if settlers have no guaranteed price for successive years they must utilise their lands for some industry that will give them an assured annual return, and hence it is that hundreds of thousands of acres in the Upper Burnett and Callide district alone, which are eminently suited for cotton production, are now being utilised for dairying.
>
> As regards new land settlement, an area of 1,475,000 acres, being the remaining available land in the Upper Burnett and Callide district, will be opened for selection in the course of the ensuing twelve months. Much of this land is suited for cotton, and would doubtlessly be utilised for growing it if prices were stabilised.
>
> A very large area, comprising hundreds of thousands of acres in the prickly-pear belt of the State, situated within easy range of existing railways, is also well suited for the production of cotton. The lands are held under prickly-pear lease tenure, and are resumable at any time for closer settlement, without compensation. These lands could be resumed and utilised for cotton production if the prices obtainable for that commodity were satisfactory to the growers and were stabilised over a period of years.

THE QUEENSLAND SUGAR INDUSTRY.

By H. T. EASTERBY, Director, Bureau of Sugar Experiment Stations.

PART IV.

(b) Review of the Industry since Federation.

It was stated in the last article that the federation of the Australian colonies brought tremendous changes to the Queensland sugar industry. It will now be attempted to show how these changes came about, and why.

The Federal idea of the bringing together of the colonies was not by any means a new one. As early as 1852 Dr. Lang, of New South Wales, advocated a great federation of all the colonies of Australia, and in 1857 the patriot Wentworth sought to bring about the creation of a Federal Assembly, and later in the same year the Victorian Assembly is stated to have appointed a select committee to consider the question, and the need for such a Union was unanimously affirmed. From time to time thereafter the matter was brought up, and the first National Australasian Convention sat in 1891. The Bill then drafted left out Queensland, Western Australia, and New Zealand. Nothing, however, was done then, and it was not until 1897-8 that a Convention was held which prepared the document that finally became the Constitution of Australia. At this Convention, Queensland was not represented, although Sir Samuel Griffith had been taking a very keen interest in the matter, but in 1899 when the subject was put to the people, Queensland voted for federation, but its majority was the smallest of any of the States, amounting to only 7,492 votes, whereas Victoria's majority was 142,848. There was not a great deal of opposition from the sugar-growers to federation, what little there was came principally from the older individual planters and millowners, who were concerned at the loss of Kanaka labour which they knew would come if federation was carried; for it was quite understood that if Queensland entered the federation the black labour system would end, and that the Commonwealth would make provision for protecting the sugar industry when it was deprived of labour from what was characterised as "an admittedly undesirable source." There is no doubt that this class of labour was always more or less distasteful to the majority of Australians.

The Commonwealth of Australia came into being on the 1st day of January, 1901, on the first day of the first month of the new century. From that time the colony of Queensland became a State, and the Commonwealth Government began to take a large part in the control of the sugar industry.

At this time there were still a few of the old type of sugar planter owing small mills who could see nothing but ruin ahead in the entire replacement of the Kanaka by white labour. Most of these men, perhaps all, have now passed away; few of them lived long enough to witness the great expansion of the industry in the years since federation, and the upsetting of all their forebodings of calamity. Still they were men of the old school trained in their beliefs, but the present day sugar-growers are of quite a different type. Even before the days of federation the new spirit was being developed by the establishment of Central Sugar Mills.

The first change brought about by federation was that the sugar markets of the various States were now free to Queensland, while a

protective duty of £6 per ton was imposed by the Commonwealth Parliament on all foreign cane sugar while, as the beet sugar bogey was even then powerful, the duty in its case amounted to £10 a ton.

The Commonwealth authorities now had to consider the best method of bringing the sugar industry under white labour. It was generally considered by those persons who had given thought to the matter that the Kanaka labour had been eminently serviceable and of considerable use in opening up the country for sugar-growing; but the time had arrived, in view of the general opinion of Australia as to coloured labour, when a change had to be made. Before any legislation was introduced the Prime Minister of the Commonwealth, Mr. Barton, commissioned Dr. Maxwell, Director of Sugar Experiment Stations, to report on certain factors relating to the sugar industry in Queensland and New South Wales. In that report, attention was drawn to the fact that estates were being cut up and divided into small farms, more particularly since the advent of the Central Sugar Mills, which had brought about a condition of things that was unique and in a large measure peculiar to the Australian cane sugar industry.

The report went on to say:—

"The most highly important economic and social result of this change is found in the circumstance that the ownership and occupancy embrace a large number of strong, responsible, and progressive white settlers, with families of coming men and women, who are being planted over the sugar-growing areas. Those settlers are furnishing the cane which keeps the mills in operation, and it is not only apparent that the maintenance of the sugar industry, but also the settlement of the country, is to be very chiefly in their hands. At this time there are 2,610 canegrowers in the State of Queensland, with an average area, per grower, under sugar-cane of 42·6 acres. . . . As labourers, working for hire, many of those settlers would never have been found on the soil; but as free men, with a personal interest in the occupancy of the lands, they are the hardest performers of given kinds of work in the field; and by their labour they have already, to a very notable extent, modified the exclusive employment of subject labour, and in localities where hitherto the white labourer had hardly been found. As a result of this white settlement, the following table sets forth a decrease in the number of Pacific Islanders employed, yet a simultaneous expansion in the sugar production:—

Year.	Acres of Cane Crushed.	Tons of Sugar Made.	Pacific Islanders in Queensland.
1885	38,557	55,796	10,755
1890	40,208	68,924	9,689
1899	79,435	123,289	8,826

"If the present natural course of white settlement is not interrupted by any untoward economic changes, there is no apparent ground for considering that it will not go on. There is abundant room for more men and families upon the areas suitable for cane culture and contiguous to manufacturing centres.

"At the present time the labour power furnished by the canegrowers themselves, and by their families, is utterly inadequate to produce the bulk of cane demanded by the mills to keep them in operation. Hired labour is, therefore, engaged to supplement

the work of the growers; and not only are the few remaining large planters employers of such labour, but most the farmers pay wages to several hired hands.

"The labour employed embraced Europeans, chiefly of the Anglo-Saxon race; and other races, including the Asiatic, the Hindoo, and the Polynesian. The great majority of the alien labourers engaged in Queensland belong to the South Sea Island tribes.

"Position of the White Labourer.

"By reason of a legislative enactment, known as the Pacific Island Labourers Act, the white labourer in Queensland holds a unique and relatively protected position. In the citation of kinds of labour which the South Sea Islander may perform, the positions of 'engineers, engine-drivers, engine-fitters, blacksmiths, wheelwrights, farriers, sugar-boilers, carpenters, sawyers, splitters, fencers, bullock-drivers, mechanics, grooms or coachmen, waggoners, or household servants' are not included, all these several kinds of employment being reserved for the selection of the white labourer.

"Compensation of the White Labourer in the Field.

"The compensation of the white labourer in the field can be exclusively in wage; or it may be in wage with rations, these including board and lodgment. The latter mode of payment is the more usual. Instead of a fixed wage being paid, work may be undertaken by contract, which may or may not be made to include rations.

"In furnishing examples of the actual compensation of white labourers in the canefields of Queensland, these will be arranged in three main divisions in order to observe what differences, if any, obtain in the respective districts. It is explained that the examples given represent averages of conditions in subdistricts, and cover very ample ground, and are thus typical of the actual situation:—

District.	Number.	Rate of Wages per Week.	Rations per Week.	Compensation per Week.
	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Bundaberg ..	1 ..	1 0 0	0 7 0	1 7 0
	2 ..	1 1 0	0 8 4	1 9 4
	3 ..	1 0 0	0 7 6	1 7 6
	4 ..	1 0 0	0 8 0	1 8 0
	5 ..	1 0 0	0 7 6	1 7 6
	Means ..	1 0 2½	0 7 8	1 7 10½
Mackay ..	1 ..	1 0 0	0 7 6	1 7 6
	2 ..	1 3 6	0 6 0	1 9 6
	3 ..	1 3 6	0 7 0	1 10 6
	4 ..	1 0 0	0 9 0	1 9 0
	5 ..	1 4 0	0 8 0	1 12 0
	6 ..	1 3 6	0 7 6	1 11 0
	Means ..	1 2 5	0 7 6	1 9 11
Cairns ..	1 ..	1 4 6	0 10 6	1 15 0
	2 ..	1 5 0	0 10 0	1 15 0
	3 ..	1 5 0	0 12 0	1 17 0
	4 ..	1 4 0	0 10 6	1 14 6
	Means ..	1 4 7½	0 10 9	1 15 4½

Plate 69.—White Australian Cane Cutters at Work, Babinda, North Queensland.

The efficiency of white labour in Queensland canefields is far superior to that of any class of labour employed.

"The compensation per week, as stated in the outer column, is made up of precise figures taken from business records. The cost of 'rations' is variable, even in the same district, and has had to be approximated, in relation to the wage factor, in the Cairns district.

"From the figures given it is seen that the compensation of the white labourer is 2s. per week greater in the Mackay district and 7s. 6d. per week greater in the Cairns district, than obtains in the district of Bundaberg. It may be of value to note the comparative rates of compensation of mill hands in the same districts. The figures given in this connection state only averages, and they are to be taken as close approximations, and not as precise statements.

WEEKLY COMPENSATION OF MILL HANDS.

Occupations.	District of Bundaberg.	District of Mackay.	District of Cairns.
	£ s. d.	£ s. d.	£ s. d.
Engineers	3 13 4	3 12 4	4 14 0
Boiler Men	1 19 8	2 1 9	2 8 4
Firemen	1 15 9	2 0 8	2 5 4
Sugar Boilers	4 3 6	3 14 0	4 16 8
Clarifiers	1 14 6	1 15 0	1 18 0
Centrifugalers	1 13 7	1 14 0	1 18 0
Cane Carriers	1 9 6	1 12 0	1 16 0
Labourers	1 7 9	1 10 4	1 15 0
Mechanics	2 14 2	2 17 6	3 0 0
Means	2 5 9	2 6 5	2 14 7

"In comparison with the rates paid to white labourers in the field the cost of the indented coloured labourer for the districts of Bundaberg, Mackay, and Cairns, is given as under:—

District.	Cost of Islander per Year.	Cost of Islander per Week.	Cost of Islander per Day.
	£ s. d.	£ s. d.	£ s. d.
Bundaberg	37 2 3½	0 14 3	0 2 4½
Mackay	32 0 10	0 12 4	0 2 0¾
Cairns	36 6 9	0 13 11½	0 2 4

COMPARISON OF AVERAGE COST OF WHITE AND COLOURED LABOUR.

Class of Labour.	Cost per Year.	Cost per Week.	Cost per Day.
	£ s. d.	£ s. d.	£ s. d.
White labour	80 7 10	1 10 11	0 5 2
Polynesian labour	36 14 10	0 14 1½	0 2 4¼

"The Polynesian labourer or 'boy' worked on an average of 59¼ hours per week and the white labourer 57½.

"It is noteworthy that at the time the inquiry was made—viz., in 1901—the co-efficient of value of labour of the white man was highest in the Bundaberg district and lowest in Cairns, while the reverse took place with the coloured labourer. The islander was worth the least and cost the most in the Bundaberg district. This was also found to be the case in New South Wales."

This report was made for the information of the Commonwealth Government, who were then considering in which form they were to provide for the replacement of the Kanaka by white labour.

The problem the Commonwealth had to deal with was to find an equitable means of meeting the general Australian desire for the cessation of coloured labour in the industry, and at the same time make the sugar industry sufficiently profitable to render it easy for the growers to engage white labour for their farms. It was recognised that this could only be done gradually, and that there must be a transition period during which black labour would gradually diminish and white labour increase. How this was done will be dealt with in the next part.

[TO BE CONTINUED.]

Bureau of Sugar Experiment Stations.

ENTOMOLOGIST'S ADVICE TO CANEGROWERS.

By EDMUND JARVIS.

How to Destroy Cane Grubs.

The following points in connection with the control of grubs of our "greyback" cockchafer will be useful to those growers in localities where beetles chanced to make a late emergence, and the work of fumigation has had to be delayed owing to prolonged wet conditions during the month of January and part of February:—

1. Before commencing soil fumigation, make sure that grubs be present by a systematic examination of some of the stools on the area believed to be infested. If finding grubs, make a note of the depth at which they happen to be feeding at the time.

2. Do not start fumigation work immediately after heavy rain, but wait until surplus moisture has drained away, leaving the soil aerated or "open" for the passage of poisonous fumes. Such precedure is imperative when using carbon bisulphide.

3. Whether employing liquid or solid doses of any fumigant the injections should be made, or the chemical buried, just above the level at which the grubs are feeding.

4. Remember that the fumes of carbon bisulphide are highly inflammable.

5. Do not inject bisulphide or paradichlorobenzene too close to stools of young plant cane, or material injury to the leaves may result, especially should the ground chance to be very dry.

6. When using paradichlorobenzene remember that small doses are better than large ones. From 1 to 1½ cwt. per acre should be sufficient for plant crops.

7. After injecting, drilling in, or otherwise burying soil fumigants, the disturbed ground above the doses should be lightly rolled in order to consolidate same.

8. Do not fumigate land broken up by cultivation, until subsequent rain has caused the friable surface to become caked over.

9. Do not defer treatment of the soil until such time as the cane leaves are starting to turn yellow, or appear to be dying.

Protect Your Beneficial Insects.

Do not destroy soil-frequenting larvæ, &c., of insect friends, which are parasitic or predaceous on grubs that injure your cane.

Some of the commonest of these may be easily recognised by the following brief descriptions:—

1. White maggot-shaped inactive larvæ, about an inch long, which when ploughed up are often found attached to dead or dying cane grubs. These spin cocoons, from which emerge digger-wasp parasites.

2. Dark-brown cocoons from ¾ to 1½ inches long, composed of silk hardened to the stiffness of paper. These are often exposed by the plough, and contain either male or female digger-wasp parasites.

3. Shining white maggots, about 1½ inch in length, but more slender than larvæ of wasp-parasites, and able to tunnel with ease amongst soil by means of a pointed beak. These turn into larvæ of Robber Flies, and while underground pierce and suck the juices of cane grubs and other subterranean larvæ.

4. Large yellowish-brown shining and very active larvæ, from 1 to 3 inches in length, and somewhat resembling wireworms in general appearance. They have six small legs close to the head-end and a darker plate with serrated edges on the upper surface of the last body segment. These slippery pugnacious creatures remain about three years in the ground before transforming into ''skip-jack'' beetles. They are inveterate enemies of cane grubs, seizing them with their sharp sickle-shaped jaws, cutting deeply into the body, and greedily imbibing its succulent contents.

CANE PESTS AND DISEASES.

Mr. R. W. Mungomery, Assistant Entomologist, Bundaberg, has submitted the following notes (17*th February,* 1930) *on mole-crickets, to the Director of the Bureau of Sugar Experiment Stations, Mr. H. T. Easterby:—*

NOTES ON MOLE-CRICKETS DAMAGING CANE.

During the autumn when a certain amount of planting is being carried on it is customary for us to receive complaints regarding the prevalence of mole-crickets in newly planted fields, these insects having the habit of eating into the centre of young cane shoots, thus producing dead hearts. Several insects have somewhat similar habits, and their effect on the cane plant is the same in all cases—i.e., the death of the young shoot which often results in a blank or ''miss.'' Wireworms and the Black Beetle are two other insects which are notorious for this kind of damage, and since they all occur in the same situations, it is not surprising to find that the damage is attributed solely to one or the other of these insects, whichever first comes under the notice of the grower, whereas often poor strikes are the result of the combined activities of these three pests.

Mole-crickets differ greatly in appearance from the ordinary cricket, since they are possessed with very strong front legs, which are eminently adapted for burrowing in the ground. These front legs are fitted with teeth somewhat like a saw, and these appendages bear a striking resemblance to the hands or feet of a mole, hence the name of these insects. With these front legs they are capable of cutting through the underground stems and roots of grasses and of burrowing to great depths in the soil.

The mole-crickets most common in this locality are about 1¼ to 1½ inches in length, and are of a light brown colour. They are sometimes found flying into houses at night, being attracted by the lights. They have two pairs of wings, a small front pair which, when the insect is not flying, are folded over a larger hind pair. These hind wings fold up in a manner similar to a fan and project over the end of the body.

When they are active in a field, their presence can readily be ascertained by their burrows, which can be seen by the disturbed surface, radiating in all parts of the field. Eggs are laid throughout the spring months, in an oval-shaped earthen chamber at a depth of about 8 inches. These eggs hatch out about a month later, so that these insects are present in great numbers during the summer and autumn months.

Control.

These crickets are kept in check under natural conditions by a small black and white striped wasp, which paralyses them and lays an egg underneath the front leg at its junction with the body. The wasp larva which hatches out from this egg feeds at the expense of the cricket which it ultimately kills. These wasps may

often be seen scouting in freshly dug trenches for any crickets that may have been exposed during digging operations.

Despite this natural check, crickets are sometimes so plentiful as to cause annoyance in newly planted cane fields, and this is usually obviated by the time and method of planting. Do not plant with cane, fields that have recently been grass paddocks, or fields where paspalum grass has been allowed to grow in profusion, for crickets are often very plentiful in such cases, especially is this so if the area is normally a wet piece of land. Wet fields should be well drained and the cane planted with a minimum of covering, so as to secure a strike as quickly as possible.

Crude napthalene placed in the soil near the plant is reported to be very efficacious in driving away these pests. This chemical has a slight retarding effect on germination, but once the cane is up and growing, it has no harmful effect on subsequent growth.

CANE PEST COMBAT AND CONTROL.

The Director of the Bureau of Sugar Experiment Stations (Mr. H. T. Easterby) has received the following report on the effect of prolonged wet conditions on the fumigation of cane-grubs, &c., January to February, 1930 *from the Entomologist at Meringa, near Cairns, Mr. E. Jarvis:—*

Continual Wet Weather Delays Cane Grub Fumigation.

The present season, which has been marked by the occurrence at short intervals of unusually wet conditions, offers much food for thought regarding the particular form of cane grub control which at the present time is occupying the thoughts of many of our growers.

On account of rainy weather experienced throughout the month of January, and its continuance to date (13th February) it has not only been out of the question to attempt starting fumigation work on soils of a heavy nature, but also inadvisable to treat even volcanic high lands.

Since the first emergence of cane beetles about the beginning of last month, only four dry days have been recorded at Meringa Station, while the precipitation here during January was no less than 37.35 inches—viz., 21.12 inches more than the average rainfall for this month registered for the district of Cairns during the last forty-six years.

Notwithstanding the abnormal climatic disadvantages experienced throughout January, however, it appears likely that similar adverse conditions may obtain until about the middle of February, since the rainfall to date (13th instant) for this month at Meringa has been 9.92 inches.

Grub fumigation cannot be carried out successfully until a spell of a few dry days has allowed time for excessive moisture to drain away. When this happens, the water which during wet weather fills the spaces between the tiny soil particles is gradually replaced by air, and the land is then said to be "open," that is to say aerated; the amount of air present depending, of course, on the size of the larger particles which make up what is known as the skeleton of the soil.

It follows then, that during seasons like the present there is always a possibility that our growers may be powerless to stop grubs of the greyback cockchafer from doing serious damage to cane roots throughout the period occupied by the second, and a portion of their third larval instars of development. Unless such injury can be prevented before or just after these larvæ have reached the third stage of growth, enough damage has usually been done to counterbalance much of the benefit likely to be derived from fumigation of the soil. When unable, through any cause, to treat grub-infested land during January there is always a likelihood, also, even in years of average rainfall, that such fumigation may be stopped or even prevented by the setting in of the wet season.

In cases where this form of control work may have been unavoidably delayed until about the end of January, it is worth noting that young cane plants from 18 inches to 2 feet 6 inches high, growing on well-drained land can often be successfully fumigated by using paradichlor. in dry crystalline state, as in the event of

rain falling a few hours after treatment, volatilisation from the nodules, although held in check temporarily while the soil continues water-logged, becomes operative again directly excess of moisture has drained away.

On such land, then, where the cane leaves have not met between the rows, thus allowing the sun to dry the surface soil, sufficient time is afforded between occasional wet spells for the paradichlor. to do its work, seeing that when applied in a crystalline form volatilisation even from injections of one-eighth of an ounce, remain operative in aerated soil for about three weeks or longer, and being practically insoluble in water do not lose weight during wet weather, the effect of which is simply to check evaporation of the chemical until such time as the weather clears up again and leaves the ground open for further permeation of the toxic fumes.

The lesson we hope to learn, however, from the present possibility of continued wet conditions interfering with grub fumigation work is the desirability of undertaking fuller investigation regarding certain effective methods of grub control which are likely to operate independently of adverse climatic influences.

Collecting Grubs and Beetles—A Common-sense Remedial Method.

In view of the possibility of our rainfall next season being of somewhat similar intensity to that experienced during the years 1909-11, 1915-17, and 1920-21—at which times the annual rainfall far exceeded 91 inches (average for Cairns district) —it appears advisable to consider the advantages likely to be derived next year from an organised campaign against our greyback cockchafer.

In the first place, it will be only fair to allude very briefly to work being done in this direction in other countries, where cane growers are faced with a problem very similar to our own—viz., the fight against various species of scarabæid grubs which feed upon the roots of cane and other plants. It is a mistake to assume, as some do, that because Australia happens to be a continent, attempts to control our indigenous insects, either by common-sense or biological methods, must necessarily prove of no avail. In Southern Central Europe, for instance, entomologists have found after fifteen years of investigations on the economy of *Melolontha melolontha*—a cockchafer beetle of practically similar size, habits, and longevity to our own greyback—that collecting these insects is still the best artificial measure known to scientists.

Referring, on the other hand, to an insular situation or habitat, we find that Mr. E. H. Barrow, the Entomologist in Porto Rico, reports as follows:—"The chief method of checking the numbers of lachnosterna (white-grubs) in Porto Rico is the collecting of larvæ and beetles" (Jnl. Dept. Agric. Porto Rico VIII., No. 2, pp. 22-26, Ap. 1924). In connection with such control work he states:—"The numbers of beetles were decreasing up to the date when collecting was stopped, and began to decrease when the collections were again made."

I may mention that beetles of the genus *Lachnosterna* much resemble our "Frenchi" cane beetle in size and appearance; while their white-grubs are like our own in general form, coloration, and root-eating habits.

Again, in Mauritius during 1925, we are told by their Chief Entomologist, Mr. d'Emmerez de Charmoy:—"The collecting of *Lachnosterna* beetles was continued in 1923-24 on the same lines as in previous years, a total of 52,000,000 insects being collected during the year." (Rev. Agric. de L'Ile Mauritius, No. 19, pp. 388-390).

In the Philippines, where beetles are collected by shaking them from the trees, in a manner very much like that adopted in the Herbert River district, such capture of both the beetles and grubs by hand "is considered the best method of control, and especially recommended."

Many other illustrations of the advantages resulting from the practice of this common-sense remedy could be quoted, from such countries as America, Russia, France, &c. As already pointed out in previous reports, Queensland canegrowers should never lose sight of the fact that in problems such as that now confronting us, entomologists have always considered ideal control methods against cockchafer beetles to be essentially those by which we succeed best in capturing or destroying as many females as possible, before they have had time to deposit eggs.

At various farmers' meetings, I have more than once stressed the importance of collecting beetles and grubs of the greyback cane beetle (*Lepidoderma albohirtum* Waterh.), but, whilst consistently advocating this common-sense remedy, wish it to be clearly understood that although urging our farmers to personal effort along such lines of activity, it behoves us also to continue assiduously to investigate those primary forms of artificial and biological control which are most likely to be effective despite any possible occurrence of adverse weather conditions.

LIFE HISTORY NOTES ON THE BANANA FRUIT-EATING CATERPILLAR (*Tiracola plagiata* Walk.).

By MARGARET E. TEMPERLEY, B.Sc.*

The noctuid moth, *Tiracola plagiata* Walk. has a wide distribution in tropical and sub-tropical regions, where it has been recorded as feeding, in the larval stage, on an extensive number of food plants, including many of economic importance.

In Queensland the earliest known reference records it as having been collected by Tryon in a Stanthorpe orchard during the departmental year 1895-1896. It is recorded as "gnawing bananas" at Currumbin during June, 1916, and there are numerous other instances of its having been recorded as a banana pest. An outbreak occurred in the Gympie district in 1919 which assumed plague proportions, the caterpillars attacking a wide range of plants. On this occasion the banana-growers suffered heavy losses. A similar outbreak occurred in 1927 in Southern Queensland, bananas being most heavily infested, and urgent requests were received by the Chief Entomologist from banana-growers and others for assistance in controlling this pest.

Acting under the instructions of Mr. Veitch, Mr. J. A. Weddell, of the Entomological Branch, visited some of the most heavily infested areas in order to collect material and to conduct field investigations and control experiments, while the writer commenced life history studies in the laboratory in Brisbane.

Information regarding the life history of this insect does not appear to have been previously published; certainly there are no Queensland records. The material received from the field and which was to form the nucleus of life history work, consisted of larvæ and pupæ, no larvæ being received at an earlier stage than about the fourth instar. In the initial field trip no eggs were found, neither were any moths observed.

It was hoped that the moths bred from this material could be induced to oviposit under laboratory conditions. As the moths emerged they were released in a small gauze breeding-cage in which young maize plants were placed to act as oviposition sites. The moths all died without laying. Later some moths were confined in small glass jars with inkweed leaves, and three sets of oviposition records were obtained, but the eggs proved infertile and shrivelled up.

However, the writer was extremely fortunate and captured a gravid female moth at Sandgate in June, 1927, which commenced laying within twenty-four hours. The eggs hatched and the caterpillars were successfully reared to maturity. A second failure to obtain fertile eggs from these moths resulted in the termination of the work on account of the inability to procure material for further study.

The results published in these notes are very inadequate as they only embrace the study of a single complete generation, and must therefore be regarded as a preliminary study until an opportunity presents itself of acquiring further details.

* Miss Temperley, who was formerly on the entomological staff of this Department, completed these notes shortly before her resignation from the Public Service.

The nature of injury occasioned by this pest, its geographical distribution, the records of previous outbreaks in Queensland, and a full list of its food plants were given in detail in the article last month by Mr. J. A. Weddell, entitled "Field Notes on the Banana Fruit-eating Caterpillar."

GENERAL DESCRIPTION.

The Egg.

The egg (Plate 70, fig. 1) is cream coloured with a greenish tinge, and measures about one-forty-second of an inch in diameter. It is dome shaped with a ribbed surface.

The Larva.

The newly emerged larva is about one-sixteenth of an inch long and is greyish in colour, the body being clothed with long fine hairs. The farmer is likely to observe the difference in colouration between the earlier and maturer stages of Tiracola larvæ and to think that two species of caterpillars are attacking his bananas. The young caterpillar has a general body colour of greyish-green to black, but the mature larva is brown.

The full grown larva (Plate 70, figs. 7 and 8) is a khaki coloured, fat, sluggish grub, about 2½ inches long, bearing in the majority of cases two pairs of black markings on its dorsal surface towards the posterior extremity, and a narrow, broken, yellow band on either side of the body.

The Pupa.

The pupa (Plate 71, fig. 1) is shiny mahogany brown in colour, and measures approximately 1 inch in length. It is found in the ground in a cocoon (Plate 71, fig. 2) made of soil particles cemented together.

The Moth.

The moth (Plate 71, figs. 3 and 4) is brown coloured, measuring about 2 inches across the wing expanse and exhibits a sex variation in colouration, the female moth being darker and more uniformly coloured than the male. The forewings are mottled, ranging from greyish-brown to chocolate-brown in the female, and from fawn to warm reddish-brown in the male, both sexes having a dark V-shaped marking towards the anterior margin of the wing. The hindwings are dark mole-coloured with a light fringe. The under surface of the wings is light-coloured and is faintly tinged with red.

BANANA FRUIT-EATING CATERPILLAR (*Tiracola plagiata* Walk.).

PLATE 70.

FIG. 1. Egg, × 20.
FIG. 2. First instar, × 8.
FIG. 3. Second instar, × 8.
FIG. 4. Third instar, × 7.
FIG. 5. Fourth instar, × 3.
FIG. 6. Fifth instar, × 2.
FIG. 7. Sixth instar, natural size.
FIG. 8. Sixth instar, natural size, lateral view

Tiracola plagiata Walk.

[illegible] —THE BANANA FR[illegible] CATERPILLAR (T[illegible])

From a Water-colour Drawing by L. W. Helmsing

LIFE HISTORY.

Food Habits of Adult.

No opportunity has been afforded of studying the food habits of this moth in nature, but it probably feeds on the nectar of flowers as it flies about at night. In the laboratory the moths were fed on a solution of sugar in water. Moths were seen feeding greedily on the syrup during the day, particularly females about to oviposit.

Longevity of Adult.

Under laboratory conditions females showed themselves to be longer lived than males. In the case of female moths the maximum longevity was seventeen days (see Table II.), while for males the maximum period was fourteen days. The average period for females was thirteen days, while the longevity of male moths averaged eight days.

Mating.

Mating has not been observed in either the laboratory or the field. Moths of both sexes were released in small breeding-cages and were also confined in pairs in glass jars, but none of the eggs laid were fertile. In order to facilitate mating, male and female moths were released in the laboratory overnight for several days, but in all cases the eggs laid failed to develop.

Oviposition.

Oviposition takes place during the night or early morning, in the laboratory the eggs being laid closely together, occasionally superimposed one upon the other. Although inkweed leaves growing in culture solution were placed in the breeding jar, the eggs were laid indiscriminately on the leaves, string, blotting paper, the sides of the jar, and its cheese cloth top. In the field, Mr. J. A. Weddell took twenty eggs which subsequently developed into Tiracola larvæ, on inkweed at Harlin, May, 1927, and in all cases except one the eggs were laid singly on either the upper or lower surfaces of the leaves. In the exceptional case two eggs were found together, one being superimposed on the other.

In the oviposition records of Table II., obtained from unfertilised moths, the maximum number of eggs laid by a single moth was 1,500, while the minimum number was 37. The period elapsing between the date of emergence of the female and the date of oviposition of the first batch of eggs averaged seven days. In the majority of cases after the first batch of eggs was deposited moths laid daily until their death. The maximum period over which eggs were laid was ten days.

A single fertile moth laid 898 eggs more than the maximum number of eggs laid by an unfertilised moth. Fewer batches of eggs were laid by this moth, and the period over which oviposition extended was six days. The dates of oviposition and the number of eggs laid will be found in Table I.

Development of the Egg.

The egg is creamy coloured and opalescent, with a slight greenish tinge. The mandibles are observed about six days after oviposition as a pair of light brownish structures showing very faintly through the chorion or egg shell, usually in an eccentric position. On the seventh day the head capsule can be seen and the development of the mandibles is more pronounced, so that they can be detected with the naked eye. The prothoracic shield is now visible immediately behind the head capsule.

By this time the egg has lost its greenish tinge and has become white. About twelve hours before hatching the dark body of the larva can be seen through the chorion, giving the egg a dark grey appearance.

Emergence of Larva.

About an hour prior to emergence, the larva can be seen moving its mandibles. With these it tears away the chorion, making a semi-circular slit at the apex of the egg, the chorion lifting back like a flap, as the larva wriggling its abdomen pushes its way out. In some cases a second slit is made towards the base of the egg, which allows the body of the larva to expand, setae and part of the abdomen protruding before the head has emerged. About twenty minutes elapse between the time the shell is first ruptured until the larva finally emerges. Upon emergence the larva devours the empty egg shell.

Incubation Period.

Eggs laid in June had an incubation period of eight to nine days, the average minimum and maximum temperatures in the laboratory for this period being 61 deg. and 67 deg. respectively. The incubation period for each batch of eggs is given in Table I.

Fertility.

In the case of the fertilised female under consideration, larvæ emerged from the great majority of eggs. Table I. shows the dates of oviposition and the number of eggs laid. In batch (1) the emergence was 100 per cent., while in (2) all the larvæ emerged except six, three of which became caught in the egg shell as they were emerging and died. Larvæ emerged from all the eggs in batch (3). In batch (4) 66 per cent. of the eggs collapsed owing to the fact that culture solution was accidentally spilt on them. Of the remaining 34 per cent., 120 larvæ emerged, while twenty-one of the eggs had ruptured shells but the larvæ failed to free themselves. The eggs of batch (5) showed well-developed head capsules but practically all of them collapsed on the eighth day, possibly owing to mechanical injury.

LARVAL PERIOD.

Behaviour.

The newly emerged larva is extremely active, and having made its first meal on the egg shell does not feed for about twenty-four hours but wanders about, in the field probably migrating far from the hatching site. The larva is very sensitive and at the slightest touch rolls over and over till it reaches the edge of a leaf, dropping from it by a silken thread and swaying about in the breeze. This habit is very marked until about the end of the fourth instar. In the field it is possible that the young larvæ are dispersed by the winds as they hang in this position.

When handled the larva secretes drops of bright green fluid, which appear to be exuded from the mouth but which come from an eversible gland on the ventral surface of the prothorax.

In the early stages the larva is positively phototropic, and in the breeding jars the larvæ collected together in large numbers on the side of the jar nearest the light. This tropism is confirmed by the field observations of Mr. Weddell, who found that bananas were damaged on that side of the bunch which received the most light.

Food Habits.

Young larvæ were placed on inkweed, milk-thistle, and banana leaves. They fed readily on inkweed and thistle, but those which were placed on banana leaves all died before they had completed the first instar. Those which survived more than three days ate so little of the cuticle that it was impossible to see the feeding marks without the aid of a lens. This inability to thrive on banana leaves in the early stages indicates a possible migration in the field from such plants as inkweed to the banana plant. Mr. Weddell found that the heaviest infestations occurred when inkweed was growing in abundance beside a plantation.

The early larval stages are surface feeders and erode the cuticle of the leaf, but about the third instar and onwards they eat the whole tissue of the leaf, commencing at the edge and eating inwards, leaving only the harder tissue of the midrib. On occasions, when no other food was available, they even ate into this.

Ecdysis.

The larva feeds vigorously, increasing in size and casts its skin and head capsule six times, undergoing what is commonly termed a moult or ecdysis. A larva about to moult has a very characteristic appearance. The head capsule appears narrow in comparison with the width of the body. The prothoracic shield which is normally in contact with the vertex of the head, becomes separated from it by an orange coloured membraneous area. The ocelli of the new head capsule can be seen as a group of purple spots showing through the membrane in a lateral position, while the ocelli of the old head capsule are colourless. For a day previous to ecdysis the larva remains perfectly quiescent, and does not feed until the old head capsule is pushed off. In the majority of cases the cast skin is devoured by the newly moulted larva, the discarded head capsule and the pale soft body of the larva indicating that a moult has taken place.

Duration of Larval Instars.

The average duration for each of the six larval instars is given in Table III., where it will be seen that the duration of the second and third instars is shorter than the first; the fourth is also shorter than the first but slightly longer than either the second or the third instars. The duration of the fifth instar is as long as the first, while the period of the sixth instar is the longest of all.

For any one larva the average feeding period is forty-five days. In Table III. it will be seen that the sixth instar is considered as having two well-defined periods—the active or feeding period and the prepupal period—so that the total duration of the sixth instar is obtained by adding the figures in these two columns together.

Effects of Food Plants on Colour Variation of the Larvæ.

Larvæ feeding on the same plant exhibit considerable variation in colouration and markings, while the difference in general colouration is most noticeable amongst larvæ which have been fed on different plants. Larvæ fed on cabbage were very pale translucent green, those on banana fruit yellowish brown with orange substigmatal bands, while those feeding on inkweed were khaki coloured with pale yellow substigmatal bands.

Prepupal Period.

When full grown the larva ceases feeding and the skin darkens, becoming more uniform in colour. The larva now migrates to the soil, burrowing below the surface to a depth of $1\frac{1}{2}$ to 2 inches, and commences the formation of an earthen cocoon. The soil particles are chewed up with the mandibles and are deposited in a moistened condition to form the walls of the cell in which the larva pupates. The larval skin becomes almost black in colour and the body becomes wrinkled and shortened, and approximately eight days after entering the soil the cuticle splits dorsally and the last larval skin and head are cast off and lie inside the cell with the pupa.

The duration of the prepupal period for a series of larvæ will be seen in Table III. and Table IV. This period varies from a minimum of six days to a maximum of ten days.

Pupal Period.

The average pupal period is twenty-nine days. At the end of this time the pupal case splits irregularly and the moth emerges from the soil.

The maximum pupal period is thirty-two days while the minimum is twenty-six days.

Parasitic Enemies.

A number of hymenopterous and dipterous parasites destructive to both larvæ and pupæ were bred from material collected in the field.

Two common parasitic wasps belonging to the Ichneumonidae were bred from pupæ, namely *Lissopimpla semipunctata* Kirby and *Paniscus testaceous* Grav. The adults of these parasites were also observed to be active in the field at Kilcoy and other places where *Tiracola* infestation was severe.

In the laboratory two hymenopterous larvæ were found spinning up in a breeding jar containing larvæ collected at Kilcoy. Each formed a dark-brown cocoon about 4 mm. long, which soon became very hard and wrinkled. Similar cocoons were brought in from Dayboro', where they were reported to be very numerous on the stems of weeds bordering plantations. A cocoon of the same type was also found at Amamoor on banana foliage. Later a small *Tiracola* larva collected at Harlin, which had been confined in a tube by itself, voided a hymenopterous larva which spun up in the tube, forming the characteristic hard wrinkled cocoon. After voiding the parasite the larva ceased feeding, became sickly, and died three days later. Up to the time of the completion of these notes no adults have emerged from these cocoons.*

Hymenopterous larvæ were found attached to the thorax of Tiracola larvæ from Kilcoy. These larvæ were bred through to the adult stage and proved to be *Euplectrus kurandaensis* Girault. The adults were released in a breeding jar containing *Tiracola* larvæ at various stages of development, and the following is a brief account of their life history.

The adult chalcid selected larvæ about the third or fourth instar on which to place the minute oval eggs, which were scattered in groups over the dorsal surface of the host. After an incubation period of four days the eggs hatched and grey coloured larvæ were found attached to

* The material subsequently dried up without yielding adults.—R.V.

the host in the region of the thorax, where they commenced feeding. When the host died the larvæ migrated to the ventral surface of the host and commenced spinning, attaching themselves to the body of the host by silken threads. Just before pupating the larvæ exuded black treacle-like globules of fluid from the anterior end, after which they become white, inactive, and the body contracted. The silken threads soon hardened, and the larvæ became concealed in shiny black cocoons. The duration of the larval period was four days. The adults emerged after a period of seven days, making a total life cycle period of fifteen days. A Tachinid fly was also reared from material collected in the field.

TECHNICAL DESCRIPTIONS.

The Egg.

(Plate 70, fig. 1.)

Average height 0·44 mm., average diameter 0·64 mm. An oblate spheroid, slightly more flattened basally than apically; semitranslucent, pearly white, iridescent, surface reticulated, having the general appearance of a golf ball.

First Larval Instar.

(Plate 70, fig. 2.)

Average length 3 mm., average breadth of head capsule 0·42 mm. Body creamy yellow, head capsule blackish. Prothoracic shield, suranal plate and tubercles mole coloured, the latter being closely approximated giving the larva a ringed appearance most marked on first three abdominal segments. Body clothed with fairly long black setæ arising from tubercles; spiracles oval with mole coloured rims; thoracic legs brown; first and second pairs of prolegs not wholly everted; prolegs bearing from 4 to 9 crochets per leg arranged in a uniordinal mesoseries. An eversible gland is present on the sternal region of the prothorax.

Second Larval Instar.

(Plate 70, fig. 3.)

Average length 7 mm., average breadth of head capsule 0·66 mm. Thorax and abdomen creamy yellow; head dark brown almost blackish; prothoracic shield, suranal plate and tubercles mole coloured, the latter bearing black setae. First three abdominal segments thickly overlaid with burnt orange, giving an irregular banded appearance; fourth segment with narrower orange band, subsequent segments not so marked, more or less blotched with orange, decided blotch on eighth and ninth segments. Thoracic legs dark brown, first and second pairs of prolegs not wholly everted but more so than previous instar; prolegs bearing from 4 to 13 crochets per leg.

Third Larval Instar.

(Plate 70, fig. 4.)

Average length 9 mm., average breadth of head capsule 0·92 mm. Head dark brown, almost blackish; thorax creamy yellow, with mole-coloured tubercles surrounded with white blotches. Setae black, prothoracic shield and suranal plate mole-coloured. Abdominal segments yellowish green with first three segments bearing well-defined brownish bands, the tubercles on these segments being very pronounced, bands on subsequent segments paler but more marked on the eighth and ninth

abdominal segments. Dorsally one median and two lateral irregular white lines from the first thoracic to the eighth abdominal segment. Thoracic legs dark brown, first and second pairs of prolegs wholly everted; prolegs bearing from 7 to 20 crochets per leg.

Fourth Larval Instar.

(Plate 70, fig. 5.)

Average length 1·5 cm., average breadth of head capsule 1·6 mm. Head dark brown with yellowish brown vertex. Thorax and abdomen green, with prothoracic shield, suranal plate, and tubercles dark mole-coloured, the latter bearing black setae. Light greyish-green dorsal strip from the first to tenth segments, bordered dorso-laterally by darker olive green area. The light dorsal strip is broken transversely on the first three abdominal segments by prominent mole-coloured tubercles. A yellow substigmatal band on abdominal segments—most prominent on segments 4 to 6 and segments 10 and 11. Spiracles surrounded by darkened area. Eleventh segment produced backwards forming a hood, mole-coloured with posterior margin ochreous. Thoracic legs brown, prolegs greenish, bearing 14 to 22 crochets per leg.

Fifth Larval Instar.

(Plate 70, fig. 6.)

Average length 3·2 cm., average breadth of head capsule 2·5 mm. Head capsule dark brown, vertex yellowish brown, prothoracic shield mole-coloured with black anterior margin. General body colour greenish-brown or khaki; thoracic segments bearing dark median line. A light dorsal area extends from first to tenth segments, eleventh segment smoky with hind margin of hood ochreous, segments eight and nine sometimes bearing a pair of black dorsal markings. Abdominal segments with yellow substigmatal band, most prominent on segments 4 to 6 and 10 and 11. Suranal plate dark brown, tubercles small, white, bearing dark setae. Spiracles with dark brown margins, thoracic legs light brown, pygidium posteriorly margined with yellow. Prolegs bear from 28 to 36 crochets per leg.

Sixth Larval Instar.

(Plate 70, figs. 7 and 8.)

Average length 4·8 cm., average breadth of head capsule 3·95 mm. Head: Face dark brown, vertex yellowish brown, emarginate, antennæ yellow, tips of mandibles reddish brown. General body colour khaki, thoracic shield smoky black with dark anterior margin. Median smoky black line on thoracic and abdominal segments. Dorsal surface slightly lighter than lateral, lighter area intermittently flanked with yellow as far as segment 10. Segments 8 and 9 bear a pair of smoky black markings, which may be transverse, crescent-shaped, or distinctly L-shaped.

PLATE 71.

FIG. 1. Pupa, natural size.
FIG. 2. Pupa, in earthen cell.
FIG. 3. Adult male, natural size.
FIG. 4. Adult female, natural size.
FIG. 5. Damage to immature fruit by young larvæ.
FIG. 6. Damage to mature fruit by later-stage larvæ.

[illegible] 71.—THE BANANA FRUIT-EATING CATERPILLAR (*Tiracola plagiata Walk*).

From a Watercolour Drawing by L. W. HELMSING.

Dorsal surface of eleventh segment darker than preceding segment, posterior margin of hood ochreous. Dorsally segment 12 uniformly darker in tone than preceding segments, bearing a smoky spot antero-laterally. Segment 13 dark like preceding segment, suranal plate smoky black with short median dark line, margin of anus bordered with creamy yellow. Thoracic legs yellowish brown darker at junction of segments. Setae dark brown to blackish, tubercles small, white, surrounded by brownish blotches. Prolegs green with black markings on outside. Laterally light yellow oblique lines tilted from before backwards on segments 1 to 8. Substigmatal bands on abdominal segments, not distinct on segments 4 and 5 and 11 to 13. Prolegs bear from 30 to 40 crochets per leg.

An eversible gland is situated on the sternal region of the prothorax. When fully everted this gland reaches to the end of the maxillæ and secretes a bright green fluid which appears to come from the mouth.

The larval instars described above were fed on inkweed leaves.

The Pupa.

(Plate 71, fig. 1.)

Average length 2.5 cm. Mahogany-brown colour, vertex slightly dome shaped, wing pads opaque. First pair of legs reaching to the tip of wing pads, second pair half way, and third pair almost to the tip of pads. Spiracles dark brown transverse slits. Abdominal segments 3 to 8 on the dorsal surface, and abdominal segments 5 to 7 on the ventral surface, have their anterior margins finely punctate. The posterior segment bears a cremaster of six hooks. The abdominal segments are sparsely clothed with light brown microscopic setae.

The Adult.

(Plate 71, figs. 3 and 4.)

The moth agrees with the following description taken from the Fauna of British India, "Lepidoptera," volume II., page 282, where it is described under the synonym *Arcilasisa.*

"Pale grey brown; abdomen fuscous. Forewing often much diffused with red-brown and irrorated with dark brown; an indistinct waved antemedial line, often almost obsolete; the orbicular obsolete; the reniform almost obsolete ochreous or fuscous, sometimes on a dark patch; traces of a postmedial curved series of black specks; a sub-marginal doubly curved ochreous line; a marginal series of black specks; hind wing fuscous; the cilia whitish."

TABLE I.—Oviposition Records for Fertilised Moth.

Number of Egg Batch.	Date of Oviposition.	Number of Eggs per Batch.	Total Number of Eggs.	Date of Emergence.	Incubation Period in Days.	Average Incubation Period in Days.
	1927.			1927.		
1	22 June	713	2,398	30 June	8	8·4
2	23 June	241		1 July	8	
3	24 June	760		2 July	8	
4	26 June	423		5 July	9	
5	27 June	261		6 July	9	

TABLE II.—Oviposition Records for Unfertilised Moths.

Number of Series.	Date of Emergence of Moth.	Period in days between Emergence and Oviposition.	Oviposition. Date.	Oviposition. Number of Eggs.	Oviposition. Total Number of Eggs.	Date of Death of Moth.	Longevity of Moth in Days.
	1927.		1927.			1927.	
B 1 ..	5 May	5	10 May	11	495	12 May	7
			11 May	235			
			12 May	249			
B 3 ..	16 May	5	21 May	34	539	*	..
			22 May	12			
			23 May	456			
			24 May	37			
L 4 ..	27 Sept.	7	4 Oct.	130	437	11 Oct.	14
			8 Oct.	124			
			9 Oct.	183			
L 38 ..	26 Sept.	6	2 Oct.	47	692	11 Oct.	15
			4 Oct.	125			
			5 Oct.	216			
			7 Oct.	304			
L 52 ..	29 Sept.	10	9 Oct.	17	823	16 Oct.	17
			11 Oct.	13			
			12 Oct.	72			
			13 Oct.	110			
			14 Oct.	62			
			15 Oct.	343			
			16 Oct.	106			
I 9 ..	23 Sept.	8	1 Oct.	37	37	2 Oct.	9
I 13 ..	24 Sept.	8	2 Oct.	50	809	9 Oct.	15
			3 Oct.	138			
			5 Oct.	158			
			6 Oct.	448			
			7 Oct.	15			
I 14 ..	25 Sept.	5	30 Sept.	230	688	5 Oct.	10
			1 Oct.	22			
			2 Oct.	53			
			3 Oct.	250			
			4 Oct.	133			
I 16 ..	25 Sept.	7	2 Oct.	130	1,365	10 Oct.	15
			3 Oct.	17			
			5 Oct.,	833			
			6 Oct.	186			
			8 Oct.	189			
			9 Oct.	10			
I 17 ..	23 Sept.	6	29 Sept.	307	1,500	8 Oct.	15
			30 Sept.	186			
			1 Oct.	192			
			2 Oct.	655			
			5 Oct.	37			
			6 Oct.	105			
			7 Oct.	10			
			8 Oct.	8			
I 18 ..	25 Sept.	4	29 Sept.	3	714	8 Oct.	13
			30 Sept.	37			
			1 Oct.	65			
			2 Oct.	90			
			3 Oct.	165			
			4 Oct.	170			
			5 Oct.	140			
			6 Oct.	1			
			7 Oct.	43			
I 19 ..	26 Sept.	7	3 Oct.	69	701	10 Oct.	14
			7 Oct.	428			
			9 Oct.	204			
I 23 ..	28 Sept.	8	6 Oct.	13	171	11 Oct.	13
			8 Oct.	44			
			9 Oct.	114			
	Average	6·61	..	..		Average	13·08

* Moth escaped.

TABLE III.—LIFE CYCLE STAGES (COMPLETE RECORDS).

Series Number.	Incubation Period in Days.	Duration of Larval Instars in Days. I.	II.	III.	IV.	V.	VI. Feeding Period.	VI. Prepupal Period.	Pupal Period in Days.	Total Life-Cycle Period in Days.
L 1	8	8	4	5	7	8	14	8	30	92
L 6	8	8	5	5	5	9	12	7	32	91
L 13.. ..	8	7	5	6	5	9	12	9	31	92
L 21.. ..	8	8	5	5	5	9	11	10	30	91
L 22.. ..	8	8	5	5	6	9	11	10	29	91
L 26.. ..	9	7	5	4	5	8	13	6	27	84
L 30.. ..	8	7	5	5	6	8	13	9	31	92
L 38.. ..	8	8	7	6	8	6	14	9	28	94
L 42.. ..	8	8	6	7	6	9	13	9	29	95
L 50.. ..	9	14	7	6	7	6	12	6	30	97
Averages ..	8·2	8·3	5·4	5·4	6·0	8·1	12·5	8·3	29·7	91·9

The period during which the above results were obtained extended from June to September.

TABLE IV.—LIFE CYCLE STAGES (INCOMPLETE RECORDS).

Series Number.	Duration of Larval Instars in Days. I.	II.	III.	IV.	V.	VI. Feeding Period.	VI. Prepupal Period.	Pupa Period
L 2 ..	8	4	5	6	8	13	..	..
L 4 ..	..	..	..	..	..	..	8	28
L 5 ..	7	5	5	6	9	14	..	..
L 14 ..	8	8	5	6	7	13	..	..
L 16 ..	8	4	5	6	9	11	..	..
L 17 ..	8	6	5	5	9	13	..	..
L 20 ..	7	5	6	5	9	14	7	..
L 25 ..	8	4	5	5	8	12	..	..
L 27 ..	7	5	5	6	7	12	6	..
L 29 ..	7	5	5	6	9	12	9	..
L 31 ..	7	7	4	7	8	14	..	..
L 35 ..	..	..	6	7	8	12	8	29
L 36 ..	8	7	7	7	8	14	..	..
L 37 ..	8	7	6	7	9	11	..	..
L 39 ..	8	7	6	6	7	13	8	..
L 40 ..	8	7	7	8	7	12	9	..
L 41 ..	8	6	4	7	8	13	8	..
L 43 ..	8	6	5	7	6	13	..	..
L 44 ..	8	8	5	7	8	12	..	..
L 47 ..	8	12	6	6	9	12	..	..
L 52 ..	..	..	..	..	..	..	9	31
L 55 ..	..	..	..	..	..	..	7	31
L 60 ..	..	..	..	..	..	..	9	30
L 61 ..	..	..	..	..	..	..	8	29
L 62 ..	..	..	..	..	..	..	7	26
L 64 ..	..	..	..	..	..	..	8	26
Averages	7·72	6·27	5·36	6·31	8·05	12·63	7·92	28·75

The period during which the above results were obtained extended from June to Se tember.

CLIMATOLOGICAL TABLE—FEBRUARY, 1930.

SUPPLIED BY THE COMMONWEALTH OF AUSTRALIA METEOROLOGICAL BUREAU, BRISBANE.

Districts and Stations.	Atmospheric Pressure. Mean at 9 a.m.	Shade Temperature. Means. Max.	Means. Min.	Extremes. Max.	Date.	Min.	Date.	Rainfall. Total.	Wet Days.
Coastal.	In.	Deg.	Deg.	Deg.		Deg.		Points.	
Cooktown	29·88	87	75	89	6	72	15	1,905	16
Herberton	..	81	63	89	28	55	14	959	15
Rockhampton	29·96	86	70	95	15,16	65	11	439	12
Brisbane	30·06	83	68	92	15	63	13,28	181	13
Darling Downs.									
Dalby	30·02	86	62	99	16	54	12	123	8
Stanthorpe	..	80	58	94	22	52	13	136	10
Toowoomba	..	77	59	90	15	56	4,12,13, 27	427	10
Mid-interior.									
Georgetown	29·85	90	72	95	14,16	67	12	706	10
Longreach	29·88	94	71	107	16	64	11	140	6
Mitchell	29·97	91	67	105	16	59	11,12	89	5
Western.									
Burketown	29·84	89	75	95	4	69	6	1,583	13
Boulia	29·83	98	73	108	16,17	66	11	367	5
Thargomindah	29·90	95	76	107	15	64	24	206	3

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF FEBRUARY IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALL DURING FEBRUARY 1930 AND 1929, FOR COMPARISON.

Divisions and Stations.	Average Rainfall. Feb.	No. of Years' Records.	Total Rainfall. Feb., 1930.	Feb., 1929.
North Coast.	In.		In.	In.
Atherton	10·14	29	17·25	21·07
Cairns	15·53	48	13·74	28·02
Cardwell	17·10	58	17·67	15·24
Cooktown	13·49	54	19·05	26·68
Herberton	7·67	43	9·59	14·63
Ingham	16·52	38	18·04	18·48
Innisfail	22·61	49	14·98	39·52
Mossman	17·41	17	34·27	31·60
Townsville	11·46	59	7·69	5·25
Central Coast.				
Ayr	9·22	43	4·12	4·15
Bowen	8·87	59	6·89	4·74
Charters Towers ..	4·51	48	3·41	4·86
Mackay	11·57	59	5·62	12·41
Proserpine	12·37	27	13·00	19·58
St. Lawrence.. ..	8·05	59	4·96	11·08
South Coast.				
Biggenden	4·36	31	3·54	7·72
Bundaberg	6·22	47	5·00	10·73
Brisbane	6·25	79	1·81	6·24
Caboolture	7·46	43	3·85	6·72
Childers	6·62	35	4·02	12·51
Crohamhurst ..	13.03	37	9·28	6·45
Esk	5·42	43	6·57	7·91
Gayndah	4·32	59	3·51	8·39
Gympie	6·66	60	3·64	10·78
Kilkivan	5·01	51	4·27	5·37
Maryborough ..	6·44	58	5·00	3·21

Divisions and Stations.	Average Rainfall. Feb.	No. of Years' Records.	Total Rainfall. Feb., 1930.	Feb., 1929.
South Coast—continued:	In.		In.	In.
Nambour	9·59	34	5·76	12·07
Nanango	4·19	48	2.35	4·13
Rockhampton ..	7·99	43	4·39	36·37
Woodford	8·47	43	5·11	6·14
Darling Downs.				
Dalby	2.87	60	1·23	2·80
Emu Vale	2·64	34	1·22	7.75
Jimbour	2·65	42	2·00	1·91
Miles	2·80	45	1·49	3·59
Stanthorpe	3·31	57	1.36	5·85
Toowoomba ..	4·51	58	4·26	10·37
Warwick	3·15	65	2·05	6·72
Maranoa.				
Roma	3·08	56	0·30	4·68
State Farms, &c.				
Bungeworgorai ..	2·53	16	0.20	3·94
Gatton College ..	3·43	31	..	5·98
Gindie	3·01	31	0·85	5·98
Hermitage	2·64	24	..	5·47
Kairi	10·02	16	8.18	15·37
Mackay Sugar Experiment Station ..	10·66	33	4·38	12·77
Warren	5·14	15	1·64	24·44

GEORGE G. BOND, Divisional Meteorologist

GROWING FODDER FOR WINTER USE IN CENTRAL QUEENSLAND.

By G. B. BROOKS, Senior Instructor in Agriculture.

With our somewhat erratic rainfall in the months from June to October, the growing of fodder crops during that period is attended with some risk, consequently it is pleasing to find that farmers in increasing number are taking the precaution of raising high-yielding succulent crops in late summer for winter use. The subjoined notes by Mr. Brooks are seasonably appropriate.

THIS method of providing an assured supply of green material has been demonstrated by the Agricultural Branch of the Department for many years. The crops recommended are sudan grass and sorghum. High-yielding varieties of the latter are being bred by the Department, and demonstration areas planted out in the various dairying districts. Sudan grass should either be fed at the beginning of winter, or cut and stacked as hay. The sorghum can be allowed to stand over and be harvested as required. In localities where very low temperatures may at times be experienced, the risk of getting severely frosted (light frosts are not damaging) is obviated by storing in a trench or stack silo. Both crops are somewhat low in protein, and when used for milk production a little lucerne or cowpea hay, cotton seed, bran, &c., will be found of much benefit.

Not a Matter of Luck.

Notwithstanding the fact that our winter rains are somewhat scant and irregular, farmers are to be found in practically every district who seldom fail to raise satisfactory crops of either barley, wheat, or oats. This is not a matter of luck, as some who have failures would suggest, but is the result of conserving the moisture in the soil by early and thorough preparation. Land for winter crops should be broken up months ahead. Ploughing one week and planting the next is only courting disaster.

Providing Feed for an Extended Period.

It is most desirable that in grazing winter crops provision should be made for the supply to last over as lengthy a period as possible. To obtain this objective, a succession of sowings made, say, every three weeks would appear desirable. Unfortunately, this practice is not to be recommended, the reason being that the winter rainfall is really too irregular to permit of its being carried out with any degree of safety. Scattered rains can usually be depended upon until June, but subsequent months are invariably dry.

Varieties to Sow.

An alternative to successive sowings is the utilisation of a number of cereal varieties that will come into the useful stage at different periods from the one planting. The selection of varieties, of course, applies more to crops that are to be cut and fed rather than to those that are to be grazed off. The matter of keeping the stock off any particular portion can, however, be overcome by the erection of a skeleton fence.

In the demonstration trials carried out by the Department for a number of years in the various dairying districts, it has been found that the following varieties have given very satisfactory results. In regard to maturity, those selected are Early, Medium, and Late, and will become available in the order named:—

Skinless barley—Rate of sowing, 1 bushel per acre.

Cape barley—Rate of sowing, 1 bushel per acre.

Florence wheat—Rate of sowing, 1 bushel per acre.

Algerian, Sunrise, or Ruakura oats—Rate of sowing, 1½ bushel per acre.

In addition to Florence, a later-maturing wheat could, if desired, take the place of the oats, such as Huguenot, Warden's Hay, or Cleveland. Wheat is much more dependable than oats in a dry season, while in a wet winter oats are subject to rust. For several years rye and Canary grass were included in these trials, but owing to the indifferent results obtained were discontinued.

Field Peas a Useful Addition.

In the event of any of the crops mentioned being raised for hand-feeding purposes, both nutritive value and yield per acre can be considerably increased by mixing with them a ½ bushel of field peas per acre. To ensure the covering of the peas, they should either be sown on a cultivated surface and lightly ploughed, or disced in. In loose or friable soil, it is a distinct advantage where the crops are to be grazed, and when a drill is not available, to disc or shallow-plough both cereals and field peas.

Time to Plant.

In order to provide feed during early winter, planting should be carried out at the earliest possible date. A good deal of risk is, however, attached to very early sowing, consequently it is advisable to allow summer conditions to pass, and the soil to cool somewhat before sowing. Should high temperatures, combined with humid conditions, follow germination, a spindly growth, failure to stool, and premature seeding will invariably result.

No actual date can, therefore, be stated, the time being dependent on climatic conditions. May, however, is generally considered a safe month to plant. In the more Western districts sowing can usually be undertaken at a somewhat earlier date than on the coast.

Crops Suitable for Pig Raising Purposes.

The Department has, by practical demonstrations, endeavoured to impress upon pig raisers the benefit accruing from the growing of root and other crops during the winter.

Although the winter rainfall is somewhat precarious, yet when due consideration has been given to the preparation of the land, a large measure of success has attended these trials.

The method adopted for the selection of crops for the dairy herd will also apply in the case of pigs—that is, to plant a range of varieties that will, from the one planting, mature over a very wide period. Planting can usually be carried out during the latter part of March or early in April. However, should the weather be hot and humid, sowing could be delayed for a week or two. Rape and Yellow Turnip are liable to aphis attack in hot weather.

The varieties mentioned will mature in the order mentioned, and should, if conditions are at all favourable, provide a feed from, say, June to December. Sow in rows 2 feet 6 inches to 3 feet apart:—

Rape—2 to 3 lb. per acre. No thinning required.

Yellow Aberdeen Turnip—2 lb. per acre. Thin to about 8 inches apart.

Field Swede Turnip—2 lb. per acre. Thin to about 8 inches apart.

Cattle Cabbage—Raise in a bed and transplant.

Sugar Beet—4 to 5 lb. per acre. Thin to about 8 inches apart.

Long Red Mangel—5 lb. per acre. Thin to about 12 inches apart.

Yellow Globe Mangel—5 lb. per acre. Thin to about 12 inches apart.

Rape and turnips should be sown at a shallow depth. The latter will give best results if planted on a slight hill. Mangels occasionally give an indifferent germination through not obtaining sufficient moisture. Either rolling or pressing the soil around the seed after sowing is an advantage. Should the soil be dry, soaking the seed prior to sowing will hasten germination. Mangels and Sugar Beet can be transplanted when about the thickness of a lead pencil, choosing dull, moist weather for this operation. Owing to the heavy yields usually obtained, Mangels will repay transplanting, utilising the thinnings. When the Scottish Delegation visited Gatton College, they unfortunately could not visit the farm on account of the heavy rains. The writer procured a dray load of Mangels for their inspection, every root weighing over 56 lb.

Field Carrots, Thousand Headed Kale, and Silver Beet are useful additions to the crops mentioned. The latter, being aphis-resistant, will provide green material during early summer, when it is not possible to grow Rape; 5 lb. of seed are required per acre. This plant is often used for culinary purposes when other vegetables are scarce.

RURAL LIFE IN OTHER LANDS.—XI.

By the EDITOR.*

BYWAYS IN BELGIUM.

IN our last talk we were discussing some minor aspects of social life in Belgium. We showed, or rather suggested, that no people have become so subjective to social and economic experiments as the Belgians, and that, whereas in other countries man has been more or less influenced—even to the extent of transportation—by his environment, in Belgium man has transformed and conquered Nature.

A Land with a Long History.

It is a mistake to regard Belgium as a modern political creation dating only from the thirties of last century. As a matter of fact, it is one of the oldest of European nationalities. Bruges, for instance, with its charming vignettes and vistas, its network of waterways that down through the ages have continued to carry the commerce of a continent, and its quaint architecture—particularly of its churches and municipal buildings—Bruges, that delights every visitor from newer and younger lands, was the Venice of Northern Europe when London was still a village. For many centuries, we are told, the Belgian people produced a common and original culture, and knocking around that country one saw many evidences of this. That culture has been municipal, not feudal; democratic, not aristocratic. In the past Belgium was mainly a federation of self-governing cities, and its municipal monuments, its town halls, its guild halls, its belfries, its church buildings, and other architectural adornments are typical of its cultural development and symbolical of its national life.

It is an interesting theme, the development of a social life of a people and its culture, but time will not allow me to follow too long that very fascinating by-path.

Physical Features.

Belgium has only forty miles of coastline, and, like Holland, much of its land surface is below sea-level. The work of reclamation in one form or another is still going on. So low-lying is much of the country that water was employed to good effect as one of the main lines of defence during the great war. The opening of dykes and the flooding of part of the country in 1914 checked, it will be remembered, especially by those Australians who fought in Flanders, substantially the invaders' advance.

The climate is something like that of the south of England, though, in my experience, much more sunless. Days of unbroken sunshine average only about twelve a year—not much good to a Southport surfer!—and generally it is cloudy and rainy. It is colder than England in winter, when if one does see the sun it appears as a pale, cheese-coloured disc, with just enough power to illuminate its own impotence.

Belgium has great mineral wealth—iron, zinc, and coal. Additional mining fields have been discovered in recent years, and as a result the bleak moorlands of the Campine, on the Dutch border, have become a thriving industrial area.

The country is equally rich in agricultural resources and every variety of produce is grown, yet all the same, like Holland, the agricultural wealth of Belgium has been created mainly by unremitting human toil.

Much of the plain of Flanders was once a desolate waste, a seemingly boundless expanse of unproductive land. Other sections around Antwerp and elsewhere formed part of a large marsh—boggy, water-logged country.

In passing, may I say that, however one may admire the industry of the European peasant as manifested in an extraordinary variety of ways, one still thinks that in a new country like Queensland what is required—and I think it is what we already have—is not a peasantry more or less overburdened, but an intelligent and technically trained yeomanry to whom primary production offers reasonable security and some financial prospects.

A Country of Workers.

Belgium is a country of farmers and artisans. Half the population live by agriculture—grain-growing, dairying, cattle-breeding, horticulture, and so forth. And the other half live by secondary industry, which is highly organised. Technical education both in the arts of field and factory is highly developed, and in the

* In a radio address from 4QG.

Workers' University at Charleroi I saw one of the most complete plants for technical instruction in full operation, with students enrolled to the full strength of the establishment.

Living Standards.

There, as in Holland, are no large landowners, and 500 acres of country is considered as an exceptionally big estate. The density of the population has created keen competition in every calling, and viewed from our standpoint wages and salaries are in consequence very low. Living standards are, however, being raised steadily through organised industry, and a powerful, ever-extending co-operative movement.

Transport.

Transport facilities are wonderfully well organised in Belgium. Brussels, the capital, is only thirty minutes journey from Louvain and Malines; it is only an hour from Antwerp and Ghent; about two and a-half hours from Ostend on the coast, and from Liege in the other direction near the German border. It is less than five hours from Paris. The road system is excellent, and everyone seems to own a bicycle. There is a close network of railways; and as feeders to the main arterial lines there are many light lines which help to keep the population well distributed. These light railways have assisted very materially in checking the exodus from the country to the cities, and have been a beneficial factor in the continuance of village life by the factory worker. One day I travelled seventy miles by an electric tramway connecting various towns and villages—starting at a place called Lobbes and passing through Binche where the British cavalry made a first contact with the invading forces in 1914, and going on to Mons, thence to La Louviere, and returning by another route to Charleroi, the whole distance being travelled in ordinary electric trams which ply between town and town and village and village.

A Centre of Commerce.

Being at the cross-roads on well-beaten international routes, Belgium is naturally a great commercial country, enjoying, in addition to its external trading enterprises, a prosperous home market. The Belgian village market to which produce is brought from the surrounding farms and sold in the open squares, and which Australian Diggers found so quaint, is one of the picturesque survivals of the middle ages and presents one of the interesting social aspects of Belgian life.

Fortunes Down a Drain Pipe.

Anyone who has had an opportunity of studying agricultural development in the old country—I mean Great Britain—will remember the fortunes that have gone, so to speak, down a drain pipe. Fortunes have been buried in deep drains and other works which our conservative forefathers considered essential to the task of reclaiming the soil. The consequence is that most people there look sideways at any reclamation project. But science has not stood still since their day, and the progressive farmer knows very well that the costly processes of old have been replaced with others much cheaper as well as more effective. Let us go to Esbeek, in Belgium, to see what can be done in the way of land reclamation with modern appliances and, incidentally, get some idea of what land settlement means in the older countries, where every arable acre and every perch of grassland is brought under tribute to man's energy and to meet man's necessity.

From Antwerp to Turnhout.

Let us start, say, from Antwerp on the light railway to a place called Turnhout. On either side of the line we see a variety of growing crops, and at the same time catch glimpses of inland sand dunes and waving heather. Leaving the railway we take a car as far as it will go, and then get out and travel on foot. Having got to that stage we have a fair idea of the country. The Campine, the country we are looking at, stretches from Antwerp into Holland, and contains the poorest land in Belgium. Standing in the middle of it we see all round a great, flat, hungry-looking plain covered with heather and presenting a picture of hopeless barrenness.

Out of the Wilderness—A Lesson in Reclaiming Waste Lands.

Out of a wilderness such as this was created the rich and beautifully wooded estate of Esbeek. The feat was not accomplished by some multi-millionaire with money to burn, nor by a paternal Government. It was done by a Dutch insurance company. That an insurance company chose such an investment for its funds was at first glance surprising, but a close observation showed its sense of values and of a satisfactory security.

Both Belgians and Dutch are tackling the job of reclaiming waste land, employing modern engineering plant—tractors and so forth—as a purely routine business matter. Very little has been written and less said about it. Instead of talking they act, and let their work supply the convincing rhetoric and its own propaganda.

The first furrow in the reclamation scheme was opened in 1901, and the whole project completed long since, and the country which was once a barren waste brought into full and payable production. Esbeek is now what is called a model agricultural and forest farm. At the time of our visit what had been formerly a sour, sandy waste was waving with wheat and rye. A herd of pedigree cattle was grazing on rich pastures as contentedly as Shorthorns on an English park or Illawarras on Queensland dairy lands. The homestead and farm buildings were on a substantial scale, and surrounded by plantations of pine trees that had been planted eighteen years before. They looked at least a century old. Orchard lands were a beautiful feature of the farm layout, and the fruit trees laden with a bountiful harvest reminded one vividly of the apple lands on the road to Rouen, down in Normandy.

The whole of this estate was wrested from utter waste in the short term of eighteen years, and the success of this and other reclamation projects has aroused interest in English counties where similar conditions exist.

A Queensland Example.

In Queensland in other forms of reclamation—the reclamation of an extraordinarily rich volcanic land from the jungle and the winning of our rich blacksoil river flats—we can present many examples of success in developing unproductive lands along every stage from the primitive to the practical, from rich promise to ripe fulfilment. But we have not as yet had to confront the problem that farmers have to face in overpeopled Europe where every acre must have its productive value, and where every plant constituent taken from the soil must be returned in full and ample measure.

It would be idle, of course, to institute comparisions, and it has not been intended, for the conditions of agriculture in the old world are in many important points so entirely dissimilar from those of Australia; and let me say this: that we in Queensland have reason to regard with some satisfaction the position we have reached in the world's industrial economy. In field practice and scientific direction we have some achievements to our credit. Queensland wheat to-day, the varieties evolved by our plant breeders—Soutter, Quodling, and others—at the Roma Experiment Station, for instance, has created a world's record for weight of grain per bushel. The work of our sugar experiment stations and that of our sugar scientists is evident in record sugar tonnages. We are dairying successfully and extensively on tropical lands, and so far as I know no other country is doing that. On every agricultural and pastoral problem we are bringing trained brains to bear on its solution. We are bringing science and technical efficiency into the paddock wherever they can be applied. We are organising agriculture under farmers' control, in every present practicable direction. And all this is to the good, but, of course, we can always learn something more about our own job; and where they apply or relate to our own particular interest, lessons from the older lands—from Britain, Denmark, Holland, Belgium, and elsewhere—will not be ignored by us.

FUR-BEARING RABBITS.

In view of the many inquiries made by persons who have been attracted by suggested possibilities in the farming of fur-bearing rabbits, the Minister of Agriculture and Stock (Mr. Harry F. Walker) announced recently that, in the absence of official information as to marketing facilities overseas, and in order to give intending investors in the industry an opportunity to ascertain the state of the market, he had arranged for a cable to the Agent-General in London, with a request to supply this information. In reply, the Agent-General has informed him to the effect that supplies of Angora rabbit wool far exceed the demand, and the average price of first-grade wool is about £1 3s. per lb. The market for Chinchilla rabbit pelts is also much depressed, as present prices for best winter only reach 5s., but average about 2s., with heavy stocks on hand.

As a result of this information the Minister suggests that caution should be exercised in the establishment of this industry, and that market possibilities should be closely studied if, as is probable, heavy supplies of rabbit fur are made available in Australia.

DENMARK'S DAIRYING INDUSTRY.

The following information on features of the Danish dairying industry has been supplied by Mr. F. Wigan, Commonwealth Dairy Officer, London, who recently visited Denmark:—

Herd Testing.

The testing of cows for production is a strong feature in Denmark, and there are no less than 1,250 Head Testing Associations, with 40,000 members, and helped by this the production of the cows has been actually doubled. The average cost per year of testing amounts to about 2s. 8d. per cow to the farmers, who transport the tester from farm to farm, and provide him with board and lodging. There are also over 1,000 Bull Clubs or associations, which, like the Herd Testing Associations, are practically all co-operative.

Careful breeding, culling, and selection, together with systematic testing of the cows, has enabled the Danes to secure a high average butter production per head, but one can see that they have realised that sufficient and scientific feeding is the basic essential for success; for, notwithstanding the production of large quantities of food on the farms, they have not hesitated to spend money on imported fertilisers to increase fodder yield, but they also import annually the large quantities of feeding stuffs I have previously referred to. Dairying depends primarily on economic and plentiful food supply, and the Danes, realising it, have shown the way to the world in developing it. This and their wonderful co-operative systems is, I think, the chief lesson for an Australian dairy farmer who visits Denmark.

Factories.

There are about 1,600 factories, or, as they term them, creameries in Denmark, 94 per cent. of which are co-operative, each receiving milk daily from 600 to 2,000 cows, averaging about 1,000 cows to the factory. I was able to visit the older type of factory and the most modern factories in both Jutland and Zealand districts. The factories are mostly of uniform plan, the milk being received on a small platform, and then passed on into a large central room of the factory where almost everything in its manufacture into butter takes place. After weighing, the milk is passed into a flash pasteuriser in which it is heated to about 130 deg. Fahr., from whence it is run into separators (usually two or three of these) and skimmed. From the separator the cream is pumped into a second flash pasteuriser where it is heated to about 195 deg. Fahr. It then passes over ordinary pipe coolers, leaving them at about 45 deg. Fahr., to enter the cream-holding vat, which in some instances is of the aluminium jacketed type without atemporators, and is situated in another room called the cream room. These cream tanks are usually fitted with an hydraulic lifting apparatus, so that by a few turns of the handle the whole cream vat is raised to a sufficient height to enable the cream to run into the churns. The cream tank is also on a small turntable, thereby enabling it to be turned in any direction necessary when emptying it. The skim milk is also pasteurised by law to a minimum of 180 deg. Fahr. before it runs into a skim milk tank, from which the farmers are returned their portion of skim milk to the farms.

In the smaller factories the churns of the long barrel type or simplex type are situated in the general manufacturing room with the separators, pasteurisers, and coolers, but I noticed the more modern ones have a separate room for the churning and the packing of the butter. The churning methods appear to be approximating ours more closely, showing a finer grain and less free moisture than it used to, and as far as I could learn the average moisture content was not much above 14½ per cent.

The factories I inspected were very clean, and had tiled walls and floors, whilst the utensils had every evidence of being well scrubbed and kept in good condition. The churns especially were given full attention with the scrubbing-brush and small quantities of washing soda and chalk used in the washing water.

Most of the factories use the gerber test for butter fat, and 85 per cent. of them the methlene blue test to detect the poor quality milk. The milk is paid for according to butterfat test, plus the results of the methylene blue test for quality, and in this way the factory manager has a full knowledge of his good suppliers, and the careless farmer is penalised for his unsatisfactory work.

All cream in Denmark for butter-making is ripened with a starter added to it in the cream vat after pasteurising and cooling. The percentage of starter used varies a little, ranging from about 2½ per cent. to 4 per cent. The cream with this added starter is well stirred and remains in the vat overnight at a temperature of about 65 deg. Fahr. until churning time in the morning. From the few starters I

saw in Denmark, and from my examinations of Danish butter generally, I have concluded that their starters must be irregular, or develop irregularly, resulting in variation in flavours and keeping quality in their butter, and from this experience I am more than ever convinced that it would be dangerous for Australia to export butter from Australia made from cream to which a starter has been added after the pasteurising of the cream.

Starters.

My interviews with Professors Orla Jensen and Knudsen at their respective laboratories enabled me to get the latest information in connection with the preparation of a suitable starter for butter-making, as Professor Orla Jensen commenced investigations concerning the bacteriology of starters some years ago, and his work has been carried on where he left it by Professor Knudsen up to the present time, whilst Professor Orla Jensen's investigations on clean milk recently have added bearing on the matter. These Professors have arrived at the opinion that certain foreign substances in milk have decided influence on the behaviour of the germ life present. For instance, when autolysed yeast phosphates and citrate of sodium have been added to pure milk, creating what is termed buffer action, a greater germ activity is noticed. They find that the chief organisms of a suitable starter consist of streptococcus cremoris and the oroma-producing bacteria which have been named bactacoccus cremoris, which have the capacity for growing well in symbiosis. Split products produced in the milk by the streptococci organisms produce conditions suitable for rapid growth of the betacocci and the formation of acidity by them.

Investigators have not yet discovered any certain two or three organisms which are alone responsible for the desirable flavour of butter if propagated in an absolutely pure milk, and it may be that certain protein-attacking organisms assist and are essential for the best results.

The starters used at the butter factories are mostly those of the powder or tablet form placed on the market under Hansen Standard Starter or the Flora Danica Brand. From these commercial starters the factory manager prepares his liquid starter by adding some of the commercial starter to a small quantity of previously sterilised skim milk—i.e., milk which has been standing in boiling water for about one hour. This process is carried on until sufficient starter is developed of suitable activity for use in the cream, 1 to ¼ per cent. of starter being used for the mother starter from day to day, whilst the cream receives somewhere about 4 per cent. starter.

I do not propose to enlarge on starters in this report, but I feel sure that with the more frequent daily deliveries of cream to the factories in Australia, the necessity of thoroughly understanding and using starters will become imperative if we wish to excel in quality with our butter.

Grading Station.

I was very anxious to visit the grading station in Copenhagen and see how the work is carried out there, consequently I arrived in Copenhagen to be there on a Monday, which is the day of each week when grading is carried out. On a given day once a week certain factories receive a telegram instructing them to send one cask of that day's manufacture immediately to the Copenhagen grading station, where it is placed in store and held at a temperature of about 60 deg. Fahr. for a fortnight. At the end of that time the casks that are a fortnight old are placed in three separate rooms for the judges to examine. The day I was there there were about 170 casks ready for judging, placed in three separate rooms, with about 50 odd casks in each room. There are nine judges to do the work, consisting of six exporters, two factory managers, and one Government expert. They are split into three groups of three, each group having two exporters, with the Government expert in one group and a factory manager in each of the other two. All the judges examine all the butters—group No. 1, say, judging in room A, whilst group No. 2 judges in room B, and group No. 3 in room C. When they have finished in these rooms they just pass on, group No. 1 going to room B, and so on, until they have all judged every cask of butter. The number of points used in judging are 15 only, and no butter ever gets 15 points. All butters scoring 10 points and upwards entitle their factories to continue using the Lur Brand for export, and the 10 points are arrived at by the average points of the nine judges for that cask. Where any great variation in points takes place, such as I saw in one instance from 8 to 13, the whole of the nine judges go and examine this butter together and arrive at a final decision for it. Very few remarks are made on the judging slips, and these only when the butter is inferior in quality. The points awarded to butter that day for

the worst butter averaged 5.8 and for the best 11.7. I was able to examine these butters, and a number of others, and compare their opinions with ours. Their highest scored butters had mild acidity and they appear to be realising the bad effect of extra high acidity on the quality of butter, for I noticed their remarks in defects against butter included the word "acidity." Although some of the terms on the grading slip were the same as we use, such as "oily," "cheesy," "unclean," "free moisture," and "acidity," I was struck with the number of butters showing low points where no explanation of the defects was set against them. Some of the best butters I saw were unsalted, and amongst the defects were overlooked flavour, unclean, cheesy, metallic, free moisture, greasiness, and streaky colour, but for the most part the butters were of good quality, and a very high percentage of them passed for the Lur Brand.

Amongst conditions for the use of the Lur Brand is that the nett weight and date of production must be marked on the Lur branded staves of the casks or on the ends of boxes, and the date of manufacture must also be stamped on the control labels placed on the butter. Many factories pay a bonus for quality, and take the Lur Brand grading 10 points as a basis—i.e., if a factory has an average grade of 11.7 that factory receives 1.7 more than the one grading 10 or standard only.

The weights of all casks of butter are checked and the butter analysed for moisture.

All factory markings on the casks and the butter are covered up so that none of the judges are aware of the identity of the butter, and they know the butters only by the numbers on the drums which are slipped over the casks. In discussing their method of grading with me, Mr. Sorensen said he was greatly impressed with the system of grading the butter at the port of export by officials, such as is done in Australia, and only because it is quite impracticable in Denmark has he not attempted to introduce it there, the reason being that the butter is exported from many centres, in strong contrast to the one or two ports of export in each State in Australia.

In this butter judging a fine system of recognising factories consistently producing high-quality butter has been instituted—i.e., a diploma is awarded to all factories who have maintained not less than Lur Brand quality without one failure during three consecutive years of grading, whilst if this record is continued for seven years a diploma of honour is issued, and a greatly coveted honour of a gold medal is given to the factory that keeps up this standard for a period of ten years without default. It was very interesting to see a list of the factories who had obtained these honours and, in the case of the gold medallists, the photograph of the manager of the factory obtaining same was hung in the meeting room of the judges at the grading station, totalling in all twenty-one gold medallists in a forty years period.

If the quality of the butter from any one factory is inferior, and continues so for two or three occasions, the manager is advised to call in the Government Dairy Expert for the district, and some little time is allowed for him to remedy the faults in the butter. If it still continues to be unsatisfactory the police are notified, and they remove all Lur Brand staves and control slips from the factory, and that factory cannot export butter until the quality of the butter is improved and they are again accepted for the Lur Brand.

Five Government dairy instructors, who are situated in various districts, as they are in Australia, are employed in supervising and helping factory managers where the quality of the butter is found to be unsatisfactory.

Government Experimental Dairy Farm.

I visited this dairy, which is situated at Hillerod, some little distance north of Copenhagen, and was pleased to meet there the manager, Mr. A. Hansen, whom I had met during the World's Dairy Congress in London, during a visit to Tooley street, where I discussed our and other countries' butters with a number of the Danish delegates to the World's Dairy Congress.

This experimental dairy is run like an ordinary factory, and receives about 3,000 gallons of milk daily from 190 odd farms, representing about 1,200 cows. The plan and lay-out of the factory is similar to the modern up-to-date factories I visited in Jutland and Zealand, and besides the manufacture of a considerable amount of butter, cheese, chiefly of Gouda and Gruyere types, is manufactured. The method of pasteurisation here is the flash system, using a temperature of about 195 deg. Fahr., and I believe that this system is practically universal throughout Denmark, and wherever I discussed pasteurisation the opinion was emphatic that the flash system was much preferable to the holding system for cream for butter making. There is, however, considerable research work going on at present with low temperature holding system pasteurisation for fresh milk for household use, in which Professor Orla Jensen is taking part, and there is a strong feeling that this is the better

system for that purpose in Denmark. The atomising system of pasteurisation, about which I will furnish a report later, was fully tried out at this factory. The plant had been dismantled and removed at the time of my visit. I hope shortly to receive the full report of its trial at this station from the agents who are having it prepared in English.

I saw here also a test of recent origin, the Hoyberg single liquid method for determining the butter-fat content in milk, to be used in place of the Gerber or Babcock tests, which had been tried out, and a full report made of its value as compared with the Gerber test at this factory. I am forwarding a report of the manager of the results of these investigations, in the form of a booklet, in which, on pages 40-41, appears a summary in English.

The management of this factory is in close touch with other Government scientists in dairying, and it is here that the practical test is applied to investigate modern methods of manufacture or science in bacteriology or chemistry of dairying, as well as new inventions of dairy machinery. It was at this factory that I was able to see milk inoculated with various starter organisms, amongst them being betacoccus, which does not produce acid when growing in pure milk by itself. It needs no stretch of imagination to realise the great importance of such an institution to the dairying industry in Denmark, and the difficulties under which experts and scientists in Australia must labour without one. One cannot too strongly urge Australia to establish at least one of these research stations.

Agricultural Education.

The need for facilities for educating the young people of Denmark in agricultural matters is met, firstly by the establishment of what are termed High Schools, where students of between eighteen and twenty-five years of age attend short courses mostly on agricultural subjects, and secondly, by the Agricultural Schools, providing higher agricultural education, principally for graduates from the High Schools. There are nineteen Agricultural Schools, with a yearly attendance of about 2,400 pupils. These schools are privately owned, but are subsidised by the Government, which also provides a number of scholarships yearly. These schools can be attended only by those who have been employed in butter factory work for a period of four years.

A full scientific training in dairying is obtainable at the Royal Veterinary and Agricultural College, at Copenhagen, which is a Government institution, the course at which occupies from two to three years, and it is at this college that quite a number of the scientists and advisers in Danish agriculture have graduated.

Agricultural Co-operation in Denmark.

Denmark is perhaps the greatest example of successful co-operation, especially in the dairying industry, of any country in the world, and it is principally through this system of getting together for mutual self help amongst the producers, and especially the small producers in Denmark, that the dairy industry has become so successful.

It was with a view to standardising dairy production that small peasants in Western Jutland formed the first co-operative creamery and dairy society in the year 1882, and from this beginning the co-operative system has grown until there are now 1,400 local dairy societies on a strictly co-operative basis, uniting under this heading nearly 200,000 farmers, or 90 per cent. of the industry. The chief principles of their co-operative system are as follow:—

(*a*) The members bind themselves for a certain period, usually ten years, to deliver to the society all milk produced in excess of that used in their homes.

(*b*) All members are jointly and severally liable.

(*c*) The profits are divided in proportion to the amount of milk delivered.

(*d*) Membership is open to all milk producers.

(*e*) Each member has but one vote.

(*f*) The general assembly is the supereme authority in the society's affairs.

The average society has about 150 members, representing approximately 900 cows. The co-operative idea after a while amongst producers was found so beneficial that its development soon included in its assisting powers many farm activities and requirements, such as herd testing associations, bull clubs, horse-breeding societies, cattle export societies, the purchase of feeding stuffs, manure supply, coal supply, farm seeds, and wholesale societies covering most of the requisites of farm and factory, until later co-operative banking institutions were included, and the export and selling of the butter was finally largely brought under the co-operative system.

BUTTER MAKING FOR HOME CONSUMPTION.

In the parts of this State where dairying is in general practice, it has become the custom to forward the cream raised on the farm to a butter factory, where the cream is received, treated, and manufactured into butter. To those supplying cream in this way to the factory, the process of manufacture of small quantities of butter on the farm is generally well understood. However, there is a number of persons scattered throughout the State who milk one or more cows, and have neither the desire nor the opportunity to tender the cream from the milk to a butter factory, but on the other hand, they are anxious to make butter from the cream. Frequently, advice upon the procedure to be followed in so doing is sought from this office, and it is with the object of meeting inquiries of this nature that the subsequent simple particulars are supplied relative to the production of milk and cream, and the manufacture of the latter product into butter. The more important matters for observation will be referred to in their natural sequence.

Primarily it must be understood that the flavour of butter is influenced by—(*a*) the class of food to which the cows have access, (*b*) the degree of cleanliness practised in the handling of the milk and cream, and the skill exercised in the manufacture of the butter.

Many varieties of weeds and some useful fodders are capable of conveying objectionable flavours or taints to milk, and, in turn, the tainted flavour is noticeable in the cream, and ultimately the flavour of the butter is affected.

The tainting influence of fodders is minimised by feeding same to cows directly after milking, but not immediately preceding same.

Thorough cleanliness is necessary to prevent contamination of the milk or cream. The cow-bail and place where the cow is milked must have an impervious floor, and be kept in a clean and sweet condition. The udder, teats, and flanks of the cow should be washed and wiped prior to milking. The hands of the person who intends to carry out the milking should be cleansed similarly.

The milk should never be exposed to an impure atmosphere.

Strain the milk without delay after it is drawn from the cow by running it through a very fine-mesh gauze or, preferably, through a strainer fitted with a wad of sterilised cotton.

The milk should next be passed through a separator, or set in dishes to allow it to cream, the separator proving by far the more satisfactory means of obtaining the cream. If setting of the milk in dishes has to be resorted to, it will be found that shallow dishes, which provide a comparatively large surface for the cream to gather upon, are more satisfactory than deeper vessels with a limited surface.

Generally the milk is allowed to sour, or even coagulate, before the cream is skimmed off, but no more cream can possibly rise to the surface after the milk has thickened. The layer of cream is removed with the aid of a utensil termed a "skimmer," the customary makeshift being a tablespoon. The objective should be to collect as much cream as possible, but to avoid gathering any of the milk with it.

The cream is best placed in an enamel vessel and should be kept as cool as possible. It must not be brought into contact with a tainted atmosphere, for the cream readily absorbs odours from such a source.

It is advisable not to mix the cream obtained by individual skimmings, or separations of the milk, until some hours before churning time, when the whole of th cream available for churning should be placed in one receptacle, and allowed to ripen uniformly. Always avoid the mixing together of hot and cool cream.

A certain amount of lactic acid should be permitted to develop on the cream before churning, and this usually requires from thirty-six to forty-eight hours, according to the care taken and the temperature at which the milk and cream are held. Holding either milk or cream at comparatively high temperatures expedites the development of the acidity.

Generally natural temperatures in Queensland, particularly during the warmer season of the year, are too high to give satisfactory results in the churning of cream, and to remedy this difficulty, artificial cooling of the cream by the aid of an ice-chest is advantageous. The water used for butter-washing purposes may be placed in a vessel and similarly cooled in the ice-chest. A more primitive means of cooling the cream is to stand the vessel containing it in water drawn from an underground well or spring; another method is to make a canvas jacket to cover the vessel holding the cream, and to arrange that the edges of the canvas covering reach a supply of water, which is drawn up by capillary attraction, and acts on the same principle as the cooling of water in a water-bag.

Usually good results in churning are obtainable by having the cream at a temperature of 56 degrees to 58 degrees Fahr. during the cooler months of the year, and reducing the temperature of the cream preparatory to churning several degrees lower throughout the warmer season.

In butter-making there are certain requisites and appliances that must be provided, even in cases where primitive methods are practised. Firstly, an ample supply of both hot and cold water must be available. The cold water is necessary for the purpose of washing the butter, and the hot water is required for use in cleansing and scalding the dairy utensils.

The water may be drawn from either a tank or well supply, provided it is wholesome. What is known as "hard" water from a well supply may be employed for washing the butter, so long as this condition of the water is caused by the presence of salt or limited percentages of other mineral matter, not injurious to health. Water containing decayed vegetable matter should not be used for washing butter.

To recover the cream from the milk, either milk setting-pans or a separator is required. The setting of milk in pans to allow the cream to rise is not to be viewed as a satisfactory or economical method of recovering cream from milk. In the first place, there is the risk that the surface of the milk will catch a deal of fine dust particles from the atmosphere while awaiting for the cream to rise; another disadvantage is, that a large percentage of the butter-fat content of the milk is not recoverable by this method. A small-sized separator provides by far the more advantageous means of recovering the butter-fat from milk. Separators of a wide range in skimming capacity are procurable, and one should be secured of a capacity in agreement with the complement of milk to be treated.

A churn is necessary. There are many types of churns that have been designed to meet the requirements of those who desire to churn, for their own use, small quantities of cream. Generally, all are capable of churning satisfactorily. For convenience, the churn should be simple in construction, durable, and so designed as to be readily cleansed.

Two butter pats for use in working and salting the butter should be provided.

Hand power butter-workers are procurable on the market, but such appliances (while admittedly most serviceable) are more suited to cases wherein the operations of the butter-maker are carried on in a comparatively large scale. In instances where it is intended to manufacture sufficient butter to satisfy the requirements of a family, the two pats are to be made to perform successfully the working and patting of the butter. This process can be carried out in a clean shallow dish if so desired.

A dairy thermometer is a most useful article, and should be included in the equipment of the dairy; and by its aid the temperatures of cream or water may be determined from time to time.

Churning is simply a mechanical process for bringing together the butter-fat globules in the cream in order to make them coalesce or unite. Preparatory to the churning of cream, the utensils used in connection with the process should be dipped in scalding water and then rinsed in clean cold water.

The whole of the cream from the various skimmings or separations of the milk (that should have been cooled and mixed in a container for some hours prior to churning time) is placed in the churn and the churn is put into operation.

If the churn is of a design that allows the operator to view the cream while churning, it will be noticed that, after some little time under the churning process, the cream will assume a paste-like consistency and possess a smooth texture. At a later stage the cream will appear to increase in density, and subsequently the texture will appear gritty. This gritty appearance of the texture of the cream is occasioned by the unison of the fat globules, and indicates that the churning is nearing completion. Care should be taken at this stage that no cream is allowed to remain stationary on the sides of the churn, and any cream attached thereto should be removed and brought under the influence of the "paddles" of the churn with the main bulk of the cream. Otherwise a portion of the cream will remain unchurned, and be carried away and lost with the butter-milk.

As soon as the cream "breaks," it is advisable to add a small quantity of cold water to flush the sides and paddles of the churn, using about half a pint of water to each quart of cream in the churn. Carry on with the churning process until the globules gather in particles about the size of a grain of wheat. Now stop the churning and allow the butter to float upon the butter-milk, which should then be drawn off. In the case where the temperature of the cream is higher than

it should be for correct churning, the butter-fat fails to assume a granular appearance, but gathers rather in the form of a mass of soft fat. However, this does not call for any change in the procedure in so far as the draining off of the butter-milk is concerned. When this is done, add wash water to the churn, and wash the butter, working the butter with the pats in order to eliminate the butter-milk as thoroughly as possible. The temperature of the wash water should be several degrees below that specified for the cream. It is well to remember that the incorporation of an excessive amount of butter-milk in the butter will result in the keeping properties of the latter being prejudicially affected.

In some cases a second washing of the butter is advantageous, but this is dependent upon the degree of success attained in removing the butter-milk in the first washing. After the washing of the butter has been effected, add fine salt to the butter in the proportion of from three-eighths to half an ounce of salt to each pound of butter.

Work the butter steadily with the pats, taking care not to injure the grain of the butter more than is necessary in expelling the excess of moisture. The working also mixes and incorporates the added salt with the butter.

If the churning of the cream has been carried out efficiently and correct temperatures observed and the butter properly washed, the moisture showing in beads on the finished article will be in the form of a crystal clear brine.

The butter is now ready for use, but as it is capable of absorbing odours given off by other strong flavoured foodstuffs, it should be stored away beyond attack from such influences in clean surroundings and kept as cool as possible.

CONTAGIOUS PNEUMONIA IN PIGS.

COMMON PREDISPOSING CAUSES.

"All coughing pigs should be regarded with suspicion. Healthy pigs do not cough frequently, and the fact that pigowners have formed the opinion, expressed in many districts, that it is normal for pigs to cough is an indication of the extent of the infection with contagious pneumonia."

This passage is extracted from a pamphlet issued by the New South Wales Department of Agriculture, concerning a condition of particular importance now that the cooler period of the year is approaching. Contagious swine pneumonia is an infectious disease which is characterised by inflammation of the lungs and the membranes lining the chest cavity and covering the lungs. The casual organism may frequently be present in small lesions in the lungs of apparently healthy pigs, and no harm appears to be caused by its presence there until the animal is subjected to unfavourable conditions which lower the body vitality and resistance to disease. These unfavourable conditions are associated with faulty management, and include:—

1. Damp low-lying situations for piggeries and yards.
2. Inadequate shelter and consequent exposure to inclement weather.
3. Damp cold floorings in sties.
4. Inadequate diet.

In addition it must be remembered, states the pamphlet referred to, that the condition when established is definitely infectious, and the introduction of an infected pig into a piggery is sufficient to cause a widespread loss from pneumonia.

The symptoms shown vary according to the form of the disease, which may be acute, sub-acute, or chronic. Diagnosis is not easily made in an isolated case, but presents no difficulty if a number of pigs are affected. Rapid breathing, coughing, discharges from the eyes and nose in the live pigs, and characteristic findings in the chest on post-mortem examination indicate that contagious pneumonia is the cause of sickness or death. The disease with which it is most likely to be confused in New South Wales is swine fever, since this is also an infectious disease in which the lungs may be involved. Swine fever, however, is a much more serious disease. Both are scheduled under the Stock Diseases Act, and must therefore be reported to the District Stock Inspector, who will take the necessary steps to see that a correct diagnosis is made.

Treatment of sick animals with medicaments is not advised. Pigs slightly affected make a rapid recovery. Where pigs are more severely effected, it is not profitable to try and cure them. Many die, and those that do make a recovery are generally stunted, unthrifty, and slow to fatten. From an economic point of view it is better to destroy them at once.

BALLANITIS IN SHEEP.

Replying to a correspondent, Mr. J. A. Rudd, L.V.Sc., of the Veterinary Staff, had this to say of a common ailment in sheep:—The wethers are suffering from Ballanitis or big pizzle, which is the common term wrongly applied to the prepuce, which is the covering externally of the penis and which in large measure protects this important organ from traumatic injury, and which is chiefly affected primarily, but ultimately, in sympathy or by direct contact, a certain amount of inflammatory oedema appears on the penis itself. The question naturally arises: What is the cause? And many and various theories have been propounded from time to time by laymen who are at times accepted as keen observers who know all about sheep. There is no doubt, however, that the one and only cause beyond all doubt is the persistent shearing away, especially since the advent of the machine shears, of the hairs which grow on the prepuce for one special purpose, and that is to drain the urine away and thereby prevent it spreading on the surrounding skin. The spread of the urine causes fissures or cracks to form around the prepuce. This is termed by some as "scalding." These fissures in time become contaminated with filth, dust, and flies, and the irritation compels the sheep to rub on any projections in the paddock such as low stumps or even on the ground, with the result that the condition becomes rapidly worse and spreads.

Prevention is by far the best method, and lies in the direction of explaining to those who shear the sheep the result of their bad work. Every sheep (wether) should be examined after he is shorn and this particular part dressed with zinc ointment (1—8) if the drainage hairs have been removed. I have also noticed that in some instances the whole prepuce has been cut clean away and the pizzle exposed. These sheep should also be dressed and carefully tended for a day or two before being returned to the flock.

Once the sheep is affected, the best practice is to shear the wool away all around the affected part and up towards the scrotum, cleanse this thoroughly with common household soap and water containing 1 dessertspoonful of phenyle to 1 gallon of water, taking care to remove all debris or decaying skin and tissue. Make a start with the scissors made for the purpose and run straight up to the limit or a very little beyond where the pus is seen to burrow. Having done this, cleanse the wound once again with the solution as recommended or, better still, with a solution made up with 1 teaspoonful of salt to 1 pint of water, adding 1 tablespoonful of phenyle to every gallon of salt solution.

The main object of using the phenyle is to keep flies away, the smell being sufficient for the purpose. If the wethers are turned out into a good grass paddock and brought in after three days and dressed once again this is generally found sufficient to effect a cure.

They should not be turned out into a dirty, dusty yard after being cleansed, but straight out over the fence and into a grass paddock. If they are caught in a yard they should be cleansed outside. An improvised hurdle yard away from the homestead is by far the better place for making a success of this treatment.

I do not think that there is anything lacking in the soil, but a good deal is lacking in care of the sheep during shearing. Big tallies are useless if sheep are cut about and exposed to injuries which are avoidable. If it is thought the soil is the cause of the affection, or is an aid in this direction, a sample of the soil should be sent down to the Agricultural Chemist for analysis and report.

A good method of discovering affected sheep in a mob is to start them ringing, when the pressure of the mob will cause the affected animals to seek relief by working their way painfully towards the circumference of the ringing mob.

A USEFUL JOURNAL.

In renewing his subscription a Willow Tree farmer writes (8th February, 1930) :—

"I find the Journal most useful and a great help."

On the same date a Kandanga farmer also writes:—

"We have every Journal since 1924, *and should not have liked to miss one. We always look forward to receiving each copy, and have had a lot of useful information from every one of them."*

DISEASES IN PLANTS ACT.

NEW REGULATIONS PROCLAIMED.

All Proclamations and Regulations under the Diseases in Plants Acts have now been rescinded and new Proclamations and Regulations issued in lieu thereof. The first Proclamation states that the Act of 1929 shall come into operation on the 27th February, 1930. Other Proclamations deal with the declaration of certain pests and diseases under the Act, the defining of certain fruit districts, the prohibition of the removal of banana plants without a permit, the introduction of grapes (fruit) from New South Wales and Victoria, the prohibition of the introduction of Codlin Moth or Fruit Fly into the Stanthorpe fruit district, the introduction or removal of plants affected with symptoms denotive of Crown Gall or Hairy Root, the introduction into Queensland of wheat for seed purposes, the declaration of sugar-cane quarantine districts and conditions of interchange of sugar-cane plants.

An Order in Council has also been drafted whereby it is compulsory that the owner or occupier of a banana orchard used for the purpose of obtaining a monetary return therefrom, shall, on or before the 31st March in each year, make application to have his orchard registered. The sum of 5s. shall be charged for such registration, and the money so obtained shall be placed to the credit of the Banana Industry Fund.

The Regulations state that no trees or plants or portions thereof, other than fruit and vegetables, shall be introduced into Queensland at any place other than the places of entry, such places of entry being Brisbane, Cairns, Rockhampton, Bowen, Townsville, Wallangarra, and such other places as may be appointed by the Minister. On its arrival at its destination, every tree or plant introduced into Queensland, and every cover, wrapper, and container thereof shall be taken into a place of quarantine for examination, inspection, treatment, or destruction. A Regulation has been made prohibiting the exporting or importing of potatoes, unless they are accompanied by a certificate declaring such potatoes to be free from specified diseases.

All cases, crates, bags, &c., containing fruit, vegetables, or plants imported into Queensland must be legibly marked, showing the grower's or exporter's name and address, all letters or figures to be not less than half an inch in length.

Any fruit which is found on inspection to be slightly diseased may be used by fruit preservers for manufacturing purposes only.

Regulations have been included which deal with the fumigation of fruit for export purposes, and directions are given for such fumigating.

Every nursery must be registered, and the fees payable will be:—

In cases where the area actually devoted to the raising of plants does not exceed ½ acre, 10s.

Where the area does not exceed 1 acre, 15s.

Where the area exceeds 1 acre, an extra 5s. for each additional acre or part thereof.

No person shall be allowed to remove any tree, plant, vegetable, or fruit thereof from the district of Bowen until it has been passed by an inspector. In that district the occupier or owner of land whereon cucurbitaceous plants are being grown shall once in every three days gather and collect all diseased fruits and destroy same by boiling or as otherwise ordered by the inspector.

All grape vines which are affected with the disease of Downy Mildew must be sprayed with Bordeaux or Burgundy mixture. No person shall allow fruit, whether diseased or not, to lie on the ground. The Regulations lay down certain rules to be followed in certain areas where Codlin Moth is present.

Persons discovering the presence of Bunchy Top of bananas in any banana plants on their land must at once notify the Department of Agriculture and Stock.

Instructions are given as to the spraying of potato and tomato plants, and the times for such spraying are set out in the Regulations.

The occupier of any land on which wheat affected with Flag Smut is growing shall burn all stubble of the wheat plants immediately after harvesting the grain.

QUEENSLAND SHOW DATES, 1930.

Dalby: 8th and 9th April.
Nanango: 10th and 11th April.
Oakey: 11th April.
Kingaroy: 15th and 16th April.
Sydney Royal: 15th to 26th April.
Miles: 16th April.
Chinchilla: 22nd and 23rd April.
Kalbar: 26th April.
Charleville: 30th April and 1st May.
Beaudesert: 30th April to 3rd May.
Wondai: 1st and 2nd May.
Wowan: 1st and 2nd May.
Goombungee: 2nd May.
Taroom: 5th to 7th May.
Mitchell: 7th and 8th May.
Mundubbera: 7th and 8th May.
Boonah: 7th and 8th May.
Murgon: 8th to 10th May.
Blackall: 13th to 15th May.
Roma: 13th and 14th May.
Goomeri: 14th and 15th May.
Gayndah: 14th and 15th May.
Wallumbilla: 20th and 21st May.
Ipswich: 20th to 23rd May.
Springsure: 21st and 22nd May.
Kilkivan. 21st and 22nd May.
Biggenden: 22nd and 23rd May.
Maryborough: 27th to 30th May.
Emerald: 28th and 29th May.
Toogoolawah: 30th and 31st May.
Marburg: 3rd June.
Childers: 3rd and 4th June.
Gin Gin: 5th to 7th June.
Bundaberg: 12th to 14th June.
Lowood: 13th and 14th June.
Miriam Vale: 16th and 17th June.
Gladstone: 18th and 19th June.
Mount Larcom: 20th and 21st June.
Rockhampton: 25th to 28th June.
Pine Rivers: 27th and 28th June.
Mackay: 1st to 3rd July.
Kilcoy: 3rd and 4th July.
Gatton: 9th and 10th July.
Woodford: 10th and 11th July.
Townsville: 8th to 10th July.
Cleveland: 12th July.
Barcaldine: 15th and 16th July.
Charters Towers: 16th and 17th July.
Caboolture: 17th and 18th July.
Rosewood: 18th and 19th July.
Ithaca: 19th July.
Laidley: 23rd and 24th July.
Nambour: 23rd and 24th July.
Esk: 25th and 26th July.
Ayr: 25th and 26th July.
Maleny: 30th and 31st July.
Royal National. 11th to 16th August.
Crow's Nest: 27th and 28th August.
Imbil: 3rd and 4th September.
Malanda: 5th and 6th September.
Gympie: 10th and 11th September.
Redcliffe: 12th and 13th September.
Beenleigh: 19th and 20th September.
Rocklea: 27th September.
Kenilworth: 27th September.

THE WORLD'S COTTON SITUATION.

Warnings of the danger to America of twenty years of almost steady deterioration of the average quality of its cotton crop, as contrasted with the efforts of other lands to improve staple grades as well as to enlarge production, are sounded by Professor John A. Todd, of Liverpool, England, in an analysis of "The World's Cotton Situation," announced recently by the Association of Cotton Textile Merchants of New York.

Weevil damage in the United States has affected quality as seriously as quantity. Due to it this country has turned to heavy-yielding cottons of early maturity, with the "Half-and-Half" variety commanding a market of sorts in domestic and Continental mills at the expense of America's better cottons. On such cotton recent short Indian crops have accounted for good prices thus far, which will be reduced on a bumper crop in India, with India and other countries able to grow more cheaply these grades that are entirely out of place in America.

Analysing the world crop according to staple, Professor Todd finds that in the fine 1½-inch to 2-inch staple, America has had no substantial part since the failure of the Sea Island crop due to the weevil. The Pima crop has recovered from the slump of 1920 to only about 25,000 bales, against 100,000 in 1930. Egypt accounts for this division with one-third of its crop of Sakel quality and with steadily increasing supplies of such grades in the Sudan. In 1¼-inch staple there has been a marked increase in Upper Egyptian cotton, lowering the price of this and East African and Peruvian growths.

In the great American middle grade, the largest new development is in India, where 1,500,000 to 2,000,000 bales per year are now of 1-inch staple. The Argentine crop has shown a marked increase in quality and has proved desirable in Lancashire in the place of good Texas cotton. Promising conditions for this grade exist in South and West Africa, Australia, Mespotamia, and the Southern Sudan. In short staples India and Korea have developed, with transportation improving future possibilities in the entire sub-tropical belt.

Answers to Correspondents.

BOTANY.

The following answers have been selected from the outgoing mail of the Government Botanist, Mr. C. T. White, F.L.S.:—

Gympie District Plants Identified.

B. (Gympie)—

1. *Smilax australis*, a species of Supple Jack or Wire Vine, not known to be poisonous.
2. *Pteridium aquilinum*, the Common Bracken Fern. The common Bracken is known to cause harm to stock, but only when they eat it in any quantity. It is not likely under the present circumstances that stock would eat enough of it to cause any trouble.
3. No specimen received bearing this number.
4. *Asclepias curassavica*, the Milky Cotton Bush or Wild Oleander, generally regarded as poisonous, but rarely eaten by stock in sufficient quantity to cause harm.
5. *Stephania hernandiæfolia*, the Tape Vine or String Vine, poisonous to stock.
6. *Desmodium* sp., a species of Tick Trefoil. These are generally regarded as useful plants in the average mixed native pasture.
7. *Lantana Camara*, the Common Lantana, when eaten in any quantity causes the disease in stock known as Pink Nose, but apparently large quantities would have to be consumed before trouble arises.
8. *Richardsonia scabra*, Mexican Clover. This plant is a native of tropical America and the southern United States. In the latter country it has been boomed as a fodder, but it is not in any way related to the true clovers, and our experience here is that stock rarely touch it.
9. *Lespedeza cuneata*, a native legume generally regarded as a useful fodder.
10. Same as No. 9.
11. No specimen was received bearing this number.
12. Fungus, impossible to determine from the specimen sent, as when it reached us it was represented more or less by a stain on the paper. Very few fungi are poisonous.
13. *Erechthites valerianæfolia*, the Federal Weed or Commonwealth Weed, not poisonous.

One specimen was received without a number. It was *Erigeron linifolius*, generally known as Rag Weed. It is not poisonous.

The specimen of decayed wood you sent we cannot determine from the material, but if anything can be done with it later on will let you know. We do not think this likely to be the cause of the trouble to which you refer.

The collection is very typical of plants growing on North Coast Line farms. If any is the cause of the trouble, we are inclined to suspect No. 5, the Tape or String Vine, *Stephania hernandiæfolia*.

Rattle-pods. *Glycine tabacina.*

R.C. (Ubobo, via Gladstone)—

No. 1 is *Crotalaria trifoliastrum*, the Small Rattle-pod. The Crotalarias or Rattle-pods are a genus of plants of which several are known to be poisonous. The one you send has come under suspicion once or twice though nothing very definite has been proved about it. In view, however, of the dangerous character of members of the genus it is as well to eradicate it from the paddocks to which the stock have access.

No. 2 is a small leguminous vine, *Glycine tabacina*, very common in the mixed native pastures of coastal Queensland and generally regarded as a very useful fodder. Though fairly common we have not heard a common name applied to it.

Poisonous Weeds.

A.A. (Pialba)—

No. 1 is *Trema aspera*, the Peach-leaf Poison Bush or Wild Peach. This plant at times develops a prussic-acid-yielding glucoside in much the same way as in young Sorghum, Soudan Grass, &c., and if eaten in any quantity at this time may cause trouble. What controls the formation of the poison in the plant is impossible to say; sometimes it is present, sometimes absent. This plant is exceedingly common in coastal Queensland, and stock often eat large quantities of it without ill effects following.

No. 2 is *Gomphocarpus fruticosus*, the Cape Cotton or Balloon Cotton. This plant often comes up very thickly on scrub farms to the exclusion of other undergrowth. It belongs to a dangerous family of plants and is generally regarded as poisonous to stock. Stock, however, rarely eat it in sufficient quantities to cause trouble.

No. 3 is *Solanum stelligerum*, the Devil's Needles or Needle Bush. All our species of Solanum may be looked on with suspicion, as they contain a poisonous principle, particularly the green berries, but losses of stock from eating these plants, common as scrub undergrowth in coastal Queensland, are very rare.

No. 4 is *Asclepias curassavica*, the Milky Cotton Bush or Wild Oleander, a very common weed in Queensland belonging to the same family as the Cape Cotton (No. 2). It, however, is rarely eaten in sufficient quantities to cause harm.

The plants you send are common ones of secondary growth in scrub country in coastal Queensland, and to a less extent on the better-class forest country. Losses of stock commonly occur on country where these plants are growing in abundance, and it is as well to clear them out if possible. The stomach contents have been handed over to the Agricultural Chemist for report.

Bull-head Grass.

Inquirer (Allora)—

Your specimen of Bull-head Grass is *Cenchrus carolinianus*, the American Burr Grass or Sand Burr Grass, a native of the United States, and regarded there as a bad weed. This is the first time apparently it has made its appearance in Queensland. Unfortunately, its burrs, which contain the seed, are readily carried about by all classes of stock, and thus the plant is distributed.

Giant Couch.

D.A.L. (Mackay)—

Your specimen is *Panicum muticum* or Para Grass, commonly known in Queensland by its botanical name or sometimes as Giant Couch. It is one of the best grasses we possess for dairying and general stock-raising purposes along the coastal belt of North Queensland. The percentage of fertility in the seed is very low and hence propagation is generally effected by means of root cuttings or by division.

Rhynchosia minima.

R.H.F. (Bowenville)—

Your specimen is *Rhynchosia minima*, a creeping legume very common in the Downs country. It is not known to have become a pest, but is generally looked on as a useful plant in general mixed native pasture. Though the plant is moderately common we have not heard a common name applied to it.

Australian Eryngo.

D.C. (Dalveen)—

Your specimen is the Australian Eryngo (*Eryngium expansum*), a moderately common weed in Queensland, most abundant in the Stanthorpe area. Though a heavy seeder it does not seem to make itself a pest to the extent one would suppose, and as it has no particular value it should be destroyed where seen.

White Oak, or "Wheel of Fire."

A.T. (Mudgeeraba)—

Your specimens represent *Stenocarpus sinuatus*, the Wheel of Fire or White Oak, one of the handsomest of our native flowering trees. Propagation is by means of seeds, but growth in the early stages of the tree is rather slow. The tree belongs to the Silky Oak family, Proteaceæ, and possesses a whitish wood with a Silky Oak grain, rather pleasing to people fond of timber of the Silky Oak type, though not too highly figured.

Chinese Goosberry. Arjun Tree.

INQUIRER (Brisbane)—

Your specimen is *Averrhoa carambola*, the Carambola or Chinese Gooseberry, a small tree, native of tropical America, widely cultivated. In India the fruits are said to be candied and made into pickles; also used as most things are in that country in curries. It is not common here, and is only grown as a curiosity, and the fruits do not seem to be used.

The dried fruit from the Maryborough Gardens is *Terminalia arjuna*, the Arjun Tree, a native of India and regarded as a valuable timber tree there.

Plants from Pittsworth Identified.

INQUIRER (Pittsworth)—

No. 1 is *Gaura parviflora*, the small-flowered Gaura, a plant of the Evening Primrose family, a native of the southern United States—Texas, Missouri, New Mexico, &c. We have only received it once before from any Queensland locality, and that was Charters Towers. It has the possibility of becoming a weed pest, but not to the same extent as the Wild Mint, another importation to your district from the United States.

No. 2 is *Bassia Birchii*, the Galvanised Burr.

No. 3 is *Bassia quinquecuspis*. This is the plant now most commonly known in Queensland as "Bindy-eye"—a name, however, in very general use for many burr plants.

Cockspur Thistle.

J.J. (Redbank Creek, Esk)—

Your specimen is the Cockspur Thistle or Saucy Jack (*Centaurea melitensis*), a native of the Mediterranean region, now common in most warm countries. In Queensland it is abundant on the Darling Downs, and is still more abundant in the Southern States. It is one of the worst weed pests we possess, and if possible should be eradicated on its appearance in fresh localities. Eradication should be done prior to seeding.

A Widely Distributed Grass (*Chrysopogon Gryllus*).

N. (Warra)—

The grass is *Chrysopogon Gryllus*, a species widely distributed in Queensland and also occurring in New South Wales, but though it has a wide distribution we have never seen it abundant in any one locality. It is generally regarded as a useful pasture grass, and is said to improve a good deal in cultivation. In spite of its utility and general spread we have not heard a common name given to it.

Rattle-pod (*Crotalaria incana*).

E.A. (Nerang)—

Your specimen is *Crotalaria incana*, a species of Rattle-pod. It has several times been suspected of poisoning stock in Queensland, and though nothing definite is known about this particular species, as several members of the genus Crotalaria have definitely been proved poisonous to stock both here and abroad, it is as well to look on the plant with suspicion and cut it out from paddocks in which stock are grazing.

Wild Cherry (*Vitex acuminata*).

J.E.E. (Mundubbera)—

Your specimen is *Vitex acuminata*, a small tree very common in the drier scrubs of Queensland, and commonly known as Wild Cherry, though this name is applied more appropriately to some other native plants. The pretty red fruits are not edible, having a nauseating taste though they are not known to be poisonous.

PIG RAISING.

(*Selected from the outward mail of the Senior Instructor in Pig Raising, Mr. E. J. Shelton, H.D.A.*)

Points in Pig Management.

W.Z. (Numinbah, Nerang)—

We regret that you have had trouble among your pigs, and have been compelled to destroy the boar. Under the circumstances, we suggest your erecting entirely new sties and providing a good pig paddock on a fresh site, and keep all new purchases away from the other pigs on the farm, for only in this way are you likely to get rid of infection and carry the new stock without undue risk.

The provision of a really good pig paddock of from one-half to one or more acres in extent would be well worth while and would not only be economically sound, but would permit of the development of healthy stock under conditions favourable to early and profitable development. Your storekeeper would quote you for suitable wire netting, and simple shelter sheds would be quite satisfactory without the necessity for more expensive sties.

The growth and use on the farm of as much of the food supply as is possible is advised, and until you are quite certain (by tuberculin test) that there is no risk of infection through skim milk, we recommend that the milk should be always scalded and cooled down before feeding the pigs.

Tuberculosis is a dangerous disease and it is quite impossible to state there is no risk of infection from unclean sties, &c.

DAIRYING.

Selected from the outgoing mail of the Supervisor in Dairying, Mr. Chas. McGrath.

Points in Dairy Cattle Breeding.

A.E.T. (Byrnestown)—

Generally it is not advisable to breed back a sire to his own progeny, which is inbreeding of stock. This practice of inbreeding has been practised by breeders skilled in the selection and mating of stock. It must be kept in mind that while desirable characteristics may be intensified, undersirable features may also be increased. In line breeding, as in inbreeding, the matter of constitution has an important bearing. It is advisable for other than skilled breeders to restrict themselves to line breeding.

I am forwarding to you, under separate cover, a copy of the "Agricultural Journal" for December, 1928, on page 592 of which you will note an article dealing with the selection and breeding of stock, with which is a table illustrating the principle of line breeding.

General Notes.

The Dairy Produce Act—Its Application Extended.

An Order in Council has now been passed under "*The Dairy Produce Act of* 1920" bringing that Act into force in the areas of the following local authorities:—Cities: The cities of Townsville and Charters Towers. Town: The town of Bowen. Shires: The shires of Johnstone, Cardwell, Hinchinbrook, Thuringowa, Dalrymple, Ravenswood, Ayr, Wangaratta, Proserpine, Mirani, Sarina, Broadsound, Livingstone, Douglas, and Eidsvold.

Staff Changes and Appointments.

The Officer in Charge of Police at Charters Towers has been appointed an Acting Inspector of Stock, as from 15th February, 1930.

The appointment of Mr. J. H. Gregory as an Instructor in Fruit Packing, Department of Agriculture and Stock, has been confirmed as from 1st August, 1929.

Mr. H. St. J. Pratt, Instructor in Fruit Culture, Stanthorpe, has been appointed also an Inspector of Stock, as from 15th February.

Mr. C. A. Joseph, of Diamond Valley, Mooloolah, has been appointed an Honorary Inspector under the Diseases in Plants Act.

Mr. S. W. Buhot, District Inspector of Stock, Toowoomba, has been appointed Government Representative on the Darling Downs Dingo Board.

The Officer in Charge of Police at Fossilbrook, North Queensland, has been appointed an Acting Inspector of Stock.

Sugar Industry—An Amended Regulation.

An amendment to Regulation 147 under and for the purposes of "*The Primary Producers' Organisation and Marketing Acts,* 1926 *to* 1928," has been made. The old Regulation 147 read as follows:—

"147. At the election in March, 1927, each Mill Suppliers' Committee, District Executive, and the Queensland Cane Growers' Council shall be elected for a period of three years, namely, for the period to the 31st March, 1930."

Regulation 147, as above, has now been rescinded, and the following has been approved in lieu thereof:—

"147. At the election in March, 1930, each Mill Suppliers' Committee, District Executive, and the Queensland Cane Growers' Council shall be elected for a period of three years, namely, for the period to the 31st March, 1933."

The Banana Industry Protection Act.

A Proclamation has been issued proclaiming the date of commencement of "*The Banana Industry Protection Act of* 1929" as the 27th February, 1930, and forty-six regulations have been made under the Act, and which are summarised thusly:—Regulations 1 to 22 deal with the transaction of business at Board meetings; 23 and 24 deal with a quorum. One representative of the Government and one representative of the growers shall form a quorum; 25, growers' representatives shall hold office for two years; 26 deals with fees. Growers' representatives shall be paid one guinea per day for each sitting or day occupied in the Board's business, plus travelling expenses at public service rates; 27, up to the 31st August the growers' representatives shall be nominated by the Committee of Direction. Their term shall cease on the 31st August, 1930; 28 to 44 deal with the election of growers' representatives, who shall hold office from the 1st September, 1930; 40, rolls of registered banana-growers entitled to vote shall be subject to the approval of the Minister; 45, all general records shall be kept in the Office of the Department of Agriculture and Stock; 46, all agreements shall be signed by the chairman or deputy chairman and be countersigned by the secretary.

The following appointments have been made to the Banana Industry Protection Board:—

Mr. G. Williams (Director of Fruit Culture), Mr. R. Veitch (Chief Government Entomologist), Government representatives;

Mr. K. R. Hack, Nerang, and Mr. A. E. Maher, Cooroy, growers' representatives;

and Mr. Williams has been appointed Chairman of the Board.

Canada Adopts Meat Grading.

An organisation for the grading and branding of beef produced in Canada has been put in operation. Two grades of beef are to be marked at the outset; "Choice," which will bear a red brand, and "Good," which will have a blue brand. The brands will be so applied that a portion of the marking will be present on any retail cut, so that the smallest consumer will be able to buy a graded product.

A recent report states that the new policy carries out the recommendations of the Joint Beef Committee, which was appointed by the National Beef Conference which was held in 1928.

Honey Board Nominations.

The following nominations have been received at the Department of Agriculture and Stock in connection with the election of four growers' representatives on the Honey Board:—

Brown, Alexander Roy (Park Ridge),
Campbell, John Duncan Colin (Hillview, Beaudesert),
Edwards, Charles William (Greenbank, via Kingston),
Fagg, Henry Edgar (South Killarney),
Schutt, John (Holstein Park, Perthton),
Spry, Augustus Frederick (Clayfield, Brisbane),
Tanner, Owen Norman (Samford),
Woodrow, Robert Victor (Woodford).

New Zealand Pig Products—Satisfactory Experiments.

The following interesting report on experiments recently carried out in England by New Zealand producers to manufacture good quality bacon from frozen pigs shipped from the Dominion has been received from Mr. R. H. Heywood, Commonwealth Veterinary Officer attached to the High Commissioner's Office, London:—

An experiment of considerable interest to pig producers in New Zealand and consumers in Great Britain was recently organised in London by the New Zealand Meat Board and the New Zealand Department of Scientific and Industrial Research, both of which organisations are giving every assistance in the establishment of a pig industry in New Zealand. The object of the experiment was to demonstrate that it is possible to manufacture good-quality bacon from frozen pigs from the Dominion. This is well known to a few, but it is desired to bring home to the whole body of interested producers and consumers, by actual demonstration, that bacon of a certain quality can be produced when efficiently cured. The experiment was undertaken by a prominent firm of curers, to whom the thanks of those who organised the experiment are due.

The frozen carcasses were manufactured into Wiltshire sides by standard methods of cure. The finished sides were judged by a panel of judges from the London Provision Exchange, whose report is briefly as follows:—

> The general conformation and proportion of sides were good and the colour and mildness of the bacon were excellent. The total points awarded for three types of cure were 81, 76, and 82 out of a total of 100, the first being a tank cure and the two latter dry salt cured.

These results are regarded as being extremely satisfactory.

A comprehensive series of cooking tests were kindly undertaken by the chief and staff of the King's College of Household and Social Science. Comparative cuts and joints of the three New Zealand bacons, best English and Danish, were cooked in five different ways and were submitted for opinions to a number of judges who were unaware of the origin of the samples. The final opinion of the college experts and others was that the New Zealand samples were at least as good as English and better than Danish in flavour, tenderness, and appearance. Another point of importance to the housewife was that all New Zealand samples lost less weight in cooking.

The promising results obtained from this experiment are of unusual interest in view of the publication of the Imperial Economic Committee's report on pigs and pig products, in which emphasis is laid on the potential importance of New Zealand as a source of pork and bacon. The fact that bacon of quality demonstrated by this experiment can be made from frozen pork is, to say the least, encouraging to those who organised the experiment, which should act as a stimulus to those endeavouring to substitute Empire products for foreign imports. It is of interest to note that bacon from New Zealand pork has been cured and marketed by several British curers for some years past.

They All Advertise.

The hen is not supposed to have much common sense or tact, yet every time she lays an egg she cackles for the fact. A rooster hasn't got a lot of intellect to show, but none the less most roosters have enough good sense to crow. The busy little bees they buzz, bulls bellow and cows moo, the watch dogs bark, the ganders quack and doves and pigeons coo. The peacock spreads his tail and squawks, pigs squeal and robins sing, and serpents know enough to hiss before they sting. But man, the greatest masterpiece that nature could devise, will often stop and hesitate, before he'll advertise.

Pig Returns—Can any other Reader beat this.

Mr. W. H. Nugent, of Milford, Boonah, writes:—"With reference to your paragraph in General Notes, February "Queensland Agricultural Journal," you ask if any reader can beat Mr. Skinner's returns for pigs, equalling £3 per dairy cow. My dairy herd consists of twenty milch cows, and I keep three to four breeding sows, also a purebred Duroc-Jersey boar. For 1928, my pig returns amounted to £110 8s. 3d., and for 1929 £100. Maize purchased to feed pigs during the two years cost £10. Skim milk, pumpkins, maize, sorghum, &c., grown on the farm made up the rest of the feed. The average return for pigs for the two years equal £5 per cow. Some of the pigs were sold as baconers and some as stores. I do not keep my pigs penned up; they have a free run in grassed paddocks fenced with seven barbed wires."

Improvement of Dairy Herds in U.S.A.

Some food for thought for Queensland dairymen:—The Secretary for Agriculture, U.S.A., recently stated that if the 22,000,000 dairy cows now in the United States were as efficient as the cows in the herd improvement associations, the same amount of milk produced by the above number of cows would be produced by 14,000,000 cows. The annual average of milk production of the association cows was 60 per cent. more efficient than the average cows. The average annual milk production from the 22,000,000 cows is only 4,600 lb., as against 7,417 lb. from cows in dairy herd improvement associations.

Here, it is stated, is a field for development to which the U.S.A. dairymen are fully awake, but which has enormous possibilities, as immense savings in feed and labour could be effected if the dairy industry had 14,000,000 cows sufficiently efficient to produce the present milk supply.

Although America produced in 1928 some 60,000,000 tons of milk, her net imports amounted to approximately 1 per cent. of her domestic requirements.

The Poisonous Plants of Queensland.

Running through the "Queenslander" for the last three months has been a valuable series of articles on the poisonous plants of Queensland. All the known and suspected poisonous species are being dealt with in this series, which is well illustrated, and all readers of this journal would be well advised to follow these articles regularly.

At the present time the known and suspected poisonous plants of the Natural Order Solanaceae are being dealt with. This order includes the potato and tomato, but most of the species are mere weeds and a large number are poisonous. A few of the plants are reputed to be usful in medicine.

Among the poisonous species of this family found in Queensland are the Apple of Sodom, Devil's Apple, Buffalo Burr, Wild Black Currant, Poison Berry or Cestrum, Stramonium or Thorn Apple, Purple Thorn Apple, Hairy Thorn Apple, Native Thorn Apple, Wild Tobacco, and Native Tobacco. Cases frequently come under the notice of the Government Botanist of stock being poisoned by eating the plants, and the descriptions given in the "Queenslander" should be very helpful to graziers and other readers. Sometimes a preparation made from a poisonous plant has a use in medicine, and where this is so reference is made to it in the articles referred to.

Botanical names are always given, mostly for check purposes, but otherwise the use unduly of technical terms is avoided, the articles being written in a style that can be followed easily by the average reader. In collecting his material the writer of the articles has consulted many publications, but the main source of information is the "Queensland Agricultural Journal," in which references to poisonous plants have appeared from time to time for over thirty years. Much assistance has also been given to him by the Government Botanist, Mr. C. T. White, F.L.S.

The "Queenslander," by giving attention and encouragement to this phase of scientific investigation, is performing a valuable service for the rural producer.

Canada's Increasing Trade.

According to an official report from Canada, in twenty years the Dominion's trade has multiplied eight times and Canada now leads all other nations in favourable trade balance per head of population. Her exports now amount to 133 per capita, which is one-third greater than Great Britain, and nearly four times that of the United States. It is also stated that Canada is making relatively faster economic progress than the United States.

Citrus Levy Extended.

Regulations have been issued under the Fruit Marketing Organisation Acts extending the Citrus Levy Regulations until the 28th February, 1931. These regulations were originally issued in February, 1926, and the new schedule just issued provides for the payment of a levy on the basis of the quantity of citrus fruit sold by a grower. It shall be at the rate of 1½d. a bushel case and ¾d. per half-bushel case, and 5s. per ton in the case of fruit used for fruit preserving. The levy shall be collected by means of levy stamps, which are obtainable from the head office of the Committee of Direction, Turbot street, and which shall be affixed to account sales or credit notes, or any other documents giving evidence of the sale of citrus fruits.

The levy is really a reduction of what formerly operated, in so far as the former levy was operative at 2d. per bushel case, and 1d. per half-bushel case, and 8s. a ton on fruit for preserving purposes.

Of the sums raised by the levy, an amount equal to 1d. per bushel case, and ½d. per half-bushel case, and 5s. per ton on citrus fruit sold for preserving purposes shall be expended only in the interests of the citrus fruit section of the fruitgrowing industry of Queensland, and the balance only upon advertising in the interests of the growers concerned.

Dairying Problems.

A recent deputation from the Queensland Co-operative Dairy Companies' Association to the Minister of Agriculture and Stock, Mr. Harry F. Walker, dealt with many questions, including the likelihood of the Buffalo Fly invading Southern Queensland; the uniform grading of butter; mammitis in dairy cattle and its prevention; the necessity of a bacteriologist being allowed to visit factories and also to do work at the laboratory; and the payment of subsidy, by various companies, on the railage and cartage of cream to the factories.

Mr. Walker pointed out that the Buffalo Fly was still being watched carefully by the officers of the Department of Agriculture, and the latest report proved that it had not come any further south than twelve months ago. He stated that the Department has got in touch with the Commonwealth Government on this matter, and the Commonwealth has convened a conference to be held in Brisbane on the 1st April, and invitations have been issued to representatives of owners of stock in the restricted area of Queensland and in Northern Australia adjacent to the border; representatives of the stock interests in Queensland and Northern Australia; representatives of the Department of Agriculture and Stock, Queensland, and of the Department of Home Affairs; with the Director, Division of Veterinary Hygiene of the Commonwealth Department of Health, as Chairman. Mr. Walker assured all present that the Department would be quite firm in carrying out the restrictions now imposed to prevent the fly coming any further south.

The question of grading dairy produce for local sales was brought up, and it was suggested by the deputation that the words "First," "Second," and "Third" be used in lieu of other markings which are used by some companies to-day. With regard to this question Mr. Walker promised to have further investigations made after consultation with other officers of the Department.

With regard to mammitis in dairy cattle, Mr. Walker pointed out that this matter was being attended to by Major Cory and Mr. Pound, who have conducted extensive investigations and are still continuing their investigations with the idea of finding some permanent preventive.

The request for a bacteriologist was acceded to, provided the request was general, and that the factories in return help the Department as much as possible by sending down to the laboratory whenever practicable samples of cream which requires attention.

Mr. Walker appealed to the members of the Butter Association to support Mr. Deacon (Minister for Lands) in his desire to see Queensland wood is used for butter boxes in lieu of any imported timber. Recent experiments, he said, had proved beyond doubt that Bunya and Hoop Pine were the best timbers to use and were less liable to impart wood taint to dairy products.

The Gospel of Good Farming.

Discussing the high standard of wheatgrowing practice of farmers who entered their crops in the championship field wheat competition in the northern area of New South Wales, the manager of Glen Innes Experiment Farm, who acted as judge, comments:—"The wheat position in the north is very bright. In past years the statement has been voiced that one good crop was enough to delay the advancement of scientific agriculture for a decade, because on these highly fertile soils it was possible to produce high-yielding crops in good seasons, quite irrespective of the cultural practice followed. Be that as it may, the gospel of good farming has now been accepted by the men that matter, and it is unthinkable that northern agriculture can do anything but progress. There seems now to be a complete understanding of the great fundamental fact that good farming is essential to good crops."

Increase Meat Sales—Attractive Joints.

The interest being shown by the meat industry in the wrapping and packaging of frosted and unfrosted fresh cuts is bringing to light some interesting subjects for speculation (says the "National Provisioner," Chicago, Ill., America).

Among these is the question of whether or not wrapping and packaging will increase meat consumption and enable the meat packer to get a larger profit from each carcass sold.

The general opinion seems to be that they will tend to increase meat sales. This is based primarily on the fact that when processed meats—such as sliced bacon, for example—were packaged, consumption of them increased.

When fresh meats are put up in a convenient form—with the added value of brand and grade identification—meat merchandisers believe the same factors that influenced the increased consumption of packaged processed meats and other packaged goods will apply.

More Popular Cuts.—But there is another angle to this subject that is only now beginning to be appreciated in connection with wrapping and packaging. This is the matter of getting out of each carcass more cuts for which a large popular demand can be built. This would mean, of course, a greater demand from each carcass.

One of the difficulties the packer has always had to contend with in the marketing of beef—and to a lesser extent with veal and lamb—is the growing tendency of the consumer to demand small steaks, chops, and the other better cuts. The trend toward apartment life, smaller families, the growing demands on the housewife's time, and the simplification of household tasks are some of the factors that have brought about this situation.

The live stock producer has met this demand by producing smaller animals of better quality. The packer might carry the process a step farther by redesigning carcass cutting methods so as to get from each animal more yield of cuts in greatest demand by consumers. In doing this there are chances to serve the small consumer.

Such a plan would involve more boning out than is now done. It would mean the preparation for broiling and frying purposes of cuts now boiled, roasted, and stewed.

Skewering, tying, pounding, larding, and slicing would make out of many of the boiling and roasting pieces nutritious, economical, and attractive cuts for a pan or broiler.

Goods Advertise Themselves.—Many of these cuts would approach the more expensive cuts in tastiness and attractiveness. They could be so designed that, when sliced, each slice would be sufficient for one serving. They would be econimical in that they would contain no bones and they could be made popular.

In addition there would be a merchandising advantage for the packer who showed ingenuity in preparing well-flavoured, attractive cuts.

The consumer is not particularly interested in what part of a carcass a piece of meat comes from; but she does want meats of good quality that will be attractive when served, and that can be prepared for the table easily and quickly.

The packer who puts out new cuts in attractive wrappings and packages will have a new field of merchandising open to him. He can give his products distinctive names, and with the right kind of advertising, induce customers to ask for his products by these names. If he does this he will build a business that will be distinctively his own, because it will be based on consumer demand.

U.S.A. Commercial and Intelligence Service.

According to Mr. A. S. Hillyer, Chief of the Commercial Intelligence Division of the U.S.A. Department of Commerce, approximately 1,000 trade men in 385 foreign countries furnish him with material for his commercial and intelligence reports. The Division concerns itself with furnishing trade lists and credit references in connection with foreign trade opportunities and affects contracts with foreign buyers visiting the United States.

Why Silage Keeps.

When corn is placed in the silo, that near the surface where it is exposed to the air becomes hot. This has led to a somewhat general belief that the whole mass of silage becomes hot. However, such is not the case, according to experiments by the Bureau of Dairy Industry, United States of America Department of Agriculture. Thermometers buried at various places in the silage showed a maximum temperature of 100 deg. Fahr., which would be termed only lukewarm. Usually the silage reached its maximum temperature in ten days or less, after which it gradually cooled. It is evident, the Bureau says, that the formation of heat is insufficient to cause sterilisation, and thus aid in the preservation of silage. Rather, the silage keeps because of the exclusion of air and the action of the acids.

Defrosting of Beef.

Mr. R. H. Heywood, Commonwealth Veterinary Officer, London, has advised the Department of Markets and Transport that a representative of one of the London meat firms recently stated at a meeting of the British Association of Refrigeration that his firm had been able to sell more frozen meat in three months since it had been defrosted than in the whole of the previous year, and that although on a particular day his firm was unable to make 3s. 6d. per stone for frozen cow hindquarters, on the following day after defrosting these sold readily at 4s. 3½d.

The following notes regarding the defrosting process were handed to Mr. Heywood by the representative above referred to:—

For a trader to achieve success it is necessary to do two things: He must produce the article in which he deals in such a way as will make it desirable to his customers, and the article itself must be of such a nature as will fulfil the requirements for which it is intended.

Now, Australian beef in the past has not met these requirements; to be brought to England on economic conditions, it must be hard frozen. Feef, when cut up into joints has an unfortunate way of appearing wet from the too quick thawing of the flesh, and further, when cooked, owing to the best part of the meat having been carried away in the sweat during the thawing, it eats dry and tasteless and thus gets a bad name.

The new method of defrosting alters all this; it stops what is called the weeping, thus goodness is retained in the meat; the meat itself becomes easier to cook and when cooked retains both quality and flavour, while cooked and uncooked, presents a pleasing appearance.

The trade in the defrosted Australian meat at first met with poor results, but after being persevered with for a few weeks, sales increased to twelve to fifteen times the quantity of the first venture. Further, the traders found that it suited their customers, and now elect this defrosted in preference to the similar quality of chilled meat. But the depots for defrosting are limited and are practically used to their full powers, but owing to the opposition defrosted meat is meeting in various bodies it will require to have the defrosting process supported from influential quarters to supply sufficient encouragement to extend the machinery for defrosting. At present, frozen meat when cut into joints, loses a large proportion of weight and most of its goodness. When defrosted it still loses weight, rather less than half of meat not defrosted, but keeps all its goodness and flavour, so that quality for quality, defrosted meat is every whit equal to chilled meat in all respects.

The point of difference is that Australian is Empire meat and the money paid for it remains in England in the form of wages, &c., for manufactured goods, while the money paid for chilled meat goes to America, and leaves England for good and all. So that if Australian frozen meat can be made equal to chilled meat for table purposes—and it can be in defrosting—then it is all to the advantage of the Empire that its sale should receive the necessary encouragement from the powers that be, and remember there is no question of increased price; if defrosted meat came into its own what change of price there might be would be in favour of the purchaser.

Disinfectants in the Dairy—Limitations.

Discussing a recent survey of the conditions existing in butter factories in a North Coast district, an officer of the Biological Branch of the New South Wales Department of Agriculture points out that undue reliance is often placed on preparations which, although they are effective germicides and have a definite value in the factory and on the farm, are entirely unable to take the place of boiling water, and are in no way to be regarded as grease or casein removers. The following paragraphs from a dairying pamphlet of the Department show just what the effective cleaning of dairy utensils involves.

A Most Important Operation.—The cleaning of dairy utensils, if somewhat irksome, is not particularly difficult, the dairy farmer is reminded. From the point of view of cream quality, it is one of the most important operations on the farm, yet sometimes it does not receive the attention it warrants. This is due largely to the fact that the bacteriological aspect is not properly understood. Owing to our climatic conditions which are so suitable for bacterial growth, improperly washed dairy utensils result in a large amount of contamination of the cream supply, with a likelihood of inferior cream. The object of cleaning dairy utensils and separator parts is not only to remove the milk or cream adhering thereto but also to kill all bacterial growth thereon. The removing of the residue of milk or cream is not difficult, and is best done with the aid of proper brushes and warm water to which a small amount of washing-soda has been added. It is important that all particles of milk or cream should be removed. Rags should not be used in the wash-up.

The next procedure is to kill the bacteria adhering to the utensils. There are two common methods of killing bacteria—one is by the use of germicides or disinfectants, and the other is by the use of heat in form of boiling water or steam. Disinfectants cannot be safely used for treating dairy utensils except in special cases, and the boiling water treatment is the general method adopted. This is very effective when properly carried out.

Hot Water Supply.—The question of an effective boiling water supply on the farm has been rendered more difficult of late years on highly improved properties by reason of the shortage of wood. This has not yet reached an acute stage generally, and where it has steps can be taken to overcome it. Older dairying countries have had the same problem to face and have adopted modern water heaters—electric heaters (where cheap power has been available) and other methods. We have hardly reached that stage, but consideration might be given on certain farms to the installation of bricked-in coppers (where not already done) as an economical means of heating water and for cleansing dairy utensils. The ordinary chip bath heater is a convenient method of using up cobs, waste paper, &c., but care must be exercised to see that the water is heated sufficiently. To effectively treat the utensils, the water must be close to boiling point. Warm water is of very little value, and water which has been heated some distance from the dairy and is left to stand at the wash-up bench for five or ten minutes after being removed from the fire quickly cools off to well below boiling point.

The most effective method is to place the separator parts and the smaller dairy utensils, after properly washing, in the vessel used for heating water (be it a copper, kerosene tin, or whatever is used), while still on the fire, making sure that the water comes to the boil. After five minutes, remove utensils and hang up or stand in a clean atmosphere. They will dry thoroughly in a few minutes without resource to rags, and will be in perfect condition for the next milking. Set-in coppers are very useful for this purpose, and are not only economical as to the wood supply but are effective in wet weather.

Chief Cause of Inferior Cream.—It is safe to say that the small percentage of inferior cream now delivered to factories would be almost eliminated if the above methods of treating dairy utensils were carried out and attention given to a few other details. By far the greater portion of this small amount of inferior cream is brought about by the utensils not being properly cared for.

It is, of course, necessary to treat the utensils as outlined *twice daily—i.e., after each milking.* Where the milking has been carried out in such a way so as to reduce bacterial contamination to a minimum, and where the separator parts and other utensils have been correctly treated as suggested, other things being equal, the cream coming from the separator will be in a sound condition from a bacteriological point of view and will not be heavily contaminated. This being so, there is eevry likelihood of it remaining in a "choice" condition until it is delivered to the factory, though certain additional precautions may be take nto assure of this being done.—A. and P. Notes, N.S.W. Dept. of Agric.

The Home and the Garden.

OUR BABIES.

Under this heading a series of short articles by the Medical and Nursing Staff of the Queensland Baby Clinics, dealing with the welfare and care of babies, has been planned in the hope of maintaining their health, increasing their happiness, and decreasing the number of avoidable cases of infant mortality.

THE TEETHING DELUSION.

A delusion may be merely foolish, but harmless. Old superstitions that do no harm may be safely left to die of themselves, as knowledge grows. Certainly they die very slowly; but that is no reason why we should be impatient. But when a delusion causes an immense amount of suffering to small babies, when it is an important cause of much sickness and many deaths then it is our duty to expose it without mercy. We can hold no truce with baby-slaughter.

How often do we see babies suffering from loose motions due to over-feeding or unsuitable feeding, or half starved from insufficient food, or food they cannot digest, or feverish from some infection, whether a simple ''cold'' or something more serious, whose mothers comfort themselves with the silly belief that it is ''just his teeth''! It would almost seem that ''teething'' is the one cause of all the complaints from which babies may suffer! Surely this is a very absurd belief. It may be very comforting to the mother (for a time), but it is often very disastrous for the baby.

Let us Know the Truth.

Let us understand the exact truth. A baby's teeth do not come into existence when they come into sight. Baby's first tooth was not formed the night before the day you noticed it. All his first set of teeth were formed long before birth; he has a full set under his gums the day he was born. He cuts his teeth at intervals up to two years of age. Therefore all babies are teething from birth up to that age, and most babies are healthy all the time, if properly cared for. As for cutting his teeth, in most cases all that happens is that you look into his mouth, and there is a tooth visible, which the day before was covered by the gum.

Healthy Babies Cut their Teeth Easily.

Teething is never a cause of serious disease. Multitudes of little lives have been lost, because mothers have put their faith in ''teething,'' and their hope in the disappearance of disease with the appearance of teeth. Sound, healthy babies cut their teeth quite easily. They may want to bite things, and they may dribble. These are quite healthy symptoms, though they may be messy. Very rarely the baby may be fractious for a day or two, perhaps there may be some discomfort in his swollen gums, and there may be some want of appetite. If you then force or entice him to take more food than he really wants he may have loose motions, but that is your fault. Delicate nervous babies are more likely to have these symptoms, but frequently they have none of them. The symptoms never require anything more than a little common-sense management.

Common Ailments Caused by Mistakes.

Of course a baby may be seriously ill about the time he is cutting his teeth, but there is always a reason for it. The teething is just a coincidence. When a baby is seriously ill, his teeth trouble him very often. You can see that they are uncomfortable, perhaps even aching. This does not mean that his sickness is caused by his teeth, as is so often thought. It means that his sickness has caused the aching of his tooth. Cutting his teeth will not improve his sickness; but get rid of his sickness, and his teeth will be all right.

Nearly all the common ailments of babyhood are caused by mistakes in feeding or management or by some infection. Your first effort, when baby is upset, should be to find out the cause. Never put it down to "teething." If you are puzzled, seek advice from your doctor or the Baby Clinic. Do not listen to old bodies who tell you "it is nothing but his teeth."

KITCHEN GARDEN.

Onions which have been planted in seed beds may now be transplanted. The ground should long since have been thoroughly cleansed, pulverised, and should be rolled previous to transplanting. Onions may still be sown in the open on clean and well-prepared ground. In favourable weather plant out cabbages, lettuce, leeks, beetroot, endive, &c. Sowings may also be made of all these as well as of peas, broad beans, kohl-rabi, radishes, spinach, turnips, parsnips, and carrots, and, where sufficiently large, thinned out. Dig and prepare beds for asparagus, using plenty of well-rotted farmyard manure.

FLOWER GARDEN.

Planting and transplanting may be carried out simultaneously during this month in showery weather; the plants will thus be fully established before the early frosts set in. Camellias and gardenias may be safely transplanted, also such soft-wooded plants as verbenas, petunias, penstemons, heliotrope, &c. Cut back and prune all trees and shrubs ready for digging. Dahlia bulbs should be taken up and placed in a shady situation out of doors. Plant bulbs, such as anemones, ranunculus, snowflakes, freesias, ixias, watsonias, iris, narcissus, daffodils, &c. Tulips will not suit the Queensland climate, but hyacinths may be tried, although success is doubtful. All shades and screens may now be removed to enable the plants to get the full benefit of the air. Fork in the mulching, and keep the walks free from weeds. Clip hedges and edgings.

MARKET GARDENING.

(Continued).

ROTATION.

Plants belonging to the same natural order should not be allowed to succeed each other on the same section of land. Some crops are a good preparation for others, as, for instance, onions after celery or carrots after beans.

Rotation assists in checking the devastations of insects and fungi to which a crop may be subject. Deep-rooted crops enrich the top soil for the benefit of shallow-rooted varieties which may follow.

Different crops require plant foods in varying proportions; hence a rotation is more economical of manure.

A definite system of rotation affords better opportunities for cleaning the ground.

Crops which occupy the ground for several years should be succeeded by others of shorter duration.

Rotations allow of a better distribution of labour during the year. Plants cultivated for their roots or bulbs should not be succeeded by others grown for a like purpose.

Rotations may extend from three to eight years, according to the size of the garden, the quality of the soil, the products required, the manures available, &c.

THE COMPOST HEAP.

Although composting is essential, it should be avoided as much as possible, for decomposition cannot be controlled without some loss of plant food. It also requires a large additional expenditure of labour in the extra handling.

In the management of compost heaps, the gardener should see that leaching and fire-fanging are controlled, and that the finest texture is secured. To accomplish these ends, it is customary to stack in rather compact, flat heaps not less than 4 ft. deep, and covering as much area as may be necessary. The heaps are so deep that there can be no leaching if they are built with perpendicular sides. They must be watered with a hose often, and freely enough to prevent fire-fanging. To improve the texture, the heaps are turned from one to three times at convenient intervals. About six months are required to secure the proper decomposition.

MANURES AND FERTILISERS.

The great advantages gained by using *improved methods of cultivation,* in combination with the *application of artificial fertilisers,* in order to increase the productiveness of the soil, are becoming gradually more recognised. It is quite self-evident that the best profits will result if small areas are made to produce heavy crops of high quality. This is achieved by "*intensive cultivation,*" as practised in other countries; but our farmers, on account of land being comparatively cheap, hardly realise what such cultivation means.

Even the richest of soil will gradually become impoverished by continuous cropping; the crops not only become lighter and of poorer quality, but are more susceptible to disease. The *plant foods* which are removed by the growing crops *must again be returned* to the soil in one form or another. With judicious application of artificial fertilisers, combined with thorough cultivation and, if possible, with rotation of crops, the fertility of the soil can not only be maintained, but is frequently considerably increased.

No artificial fertiliser will be of any value if it does not supply in *adequate proportion, all the necessary plant foods* required by the crops and what are wanting also in the soil. Excess of one plant food cannot make up for the absence or deficiency of another. In this respect, grave mistakes have frequently been made, and much money squandered in applying manures which only supply a part of the necessary plant foods and, perhaps, one which was not wanted at all. How often in practice have large amounts of bonemeal been applied to land, with a negligible result, because potash or nitrogen was wanting more than the phosphoric acid.

Artificial fertilisers will not be of *any value* to land unless it is in *good tilth,* is *well drained,* and contains a sufficient amount of *humus* and *moisture.*

Situation, class of soil, climatic conditions, and rainfall are determining factors in the selection of crops for certain districts.

The importance of *humus* in the soil is frequently quite overlooked by many farmers and fruitgrowers. Unfortunately, a large number of our soils are deficient in the amount of humus they contain, and the customary methods of cultivation and climatic conditions have a tendency to continually lower the amount. A reduction of the humus content of a soil lowers its capacity to absorb and retain moisture and adversely alters its mechanical condition.

The amount of humus may be increased by the addition of bulky amounts of vegetable matter, dead leaves, straw, cornstalks, and more particularly by *stable manure.* Small amounts of stable manure, used in addition to artificial fertilisers, have a very beneficial action, and increase the value of the artificial fertiliser, by increasing bacterial activity in the soil.

Stable manure is, however, generally very scarce, and the most economical way to supply to the soil the necessary humus, is by the practice of growing and ploughing in of *green manure crops.* As a rule, vigorous-growing leguminous crops—like cowpeas, field peas, manuritius beans, &c.—are to be preferred; but excellent results are frequently obtained with rape and mustard. The crop has to be chosen according to locality and season.

By growing crops in a *proper rotation,* and applying the manures required for each crop, soil fertility will be maintained.

In many soils the want of *lime* is apparent, and is frequently shown by strong *acid reaction of soil* and subsoil. Many plants are very susceptible to soil acidity; and application of artificial fertilisers, and more particularly such with an acid reaction, is frequently an absolute waste of money, unless the acidity is corrected by a previous application of lime in one form or another. Only in the case of heavy, clayey soils the use of *quick lime* or *air-slaked lime* is to be recommended; for lighter soils *carbonate of lime,* in the form of limestone screenings, or pulverised limestone, and also *sulphate of lime* or gypsum, are to be preferred, and all have to be applied as a topdressing. Particularly after ploughing in heavy crops of green manure, many soils develop a high acidity, and may require liming.

As a rule, soils under cultivation for some years will require *complete fertilisers*, which contain sufficient amounts of nitrogen, potash, and phosphoric acid, in order to obtain good crops and maintain the fertility of the soil.

The plant foods which are generally supplied by artificial fertilisers are:—

Nitrogen, Potash, and *Phosphoric Acid;* and, as they may be used in various forms, a few remarks on these points are necessary. It must be also borne in mind that the plants can only absorb, by the aid of the roots, such *mineral plant foods* which are actually in solution; and, therefore, *sufficient moisture* must be present in the soil, and the plant foods in the manure should be in a fairly *soluble form*. It is always best to use artificial fertilisers in the most concentrated form, in order to save freight and handling. The *composition* of all *artificial fertilisers* on the market is published from time to time in the *Queensland Agricultural Journal*.

Nitrogen is one of the most important and, at the same time, most expensive ingredients of artificial fertilisers.

Nitrogen promotes and stimulates the growth of leaves and stem, but rather retards, on account of a more luxuriant growth, the development of buds and flowers. The leaves generally show a deep-green colour, and the whole plant becomes more vigorous after application of a nitrogenous manure. In the form of *nitrates* it is most active and most readily available to plant life, and is generally applied in the form of *nitrate of soda*, or *Chili saltpetre*, which contains from 15½ to 16 per cent. of nitrogen. Saltpetre is, however, very soluble and, unless directly used up by the plant, may be readily leached out and lost in the drainage water. At the present day it is being replaced by the artificial product *nitrate of lime*, which is just as active and available, but not so easily leached out, and has a much better action on the soil on account of the large amount of lime it contains. Both fertilisers, and more particularly the nitrate of lime, absorb moisture from the air, are not suitable to mix with other fertilisers, and are also bad to handle. They are generally applied as top-dressings in repeated small amounts at the time when the crop is ready to utilise them.

Dried blood contains from 12 to 13 per cent. of nitrogen in a fairly available form, and many crops seem to benefit particularly by this nitrogenous manure, which, however, is rather scarce and not easily obtainable. Blood may be mixed with other fertilisers, and can be applied some time before planting.

Sulphate of ammonia contains about 20½ per cent. of nitrogen in a very soluble form, which, although being so soluble, is not easily leached from the soil, and becomes gradually changed into the active form of nitrate by the action of bacteria. It can be mixed with other artificial fertilisers, except those which contain free lime.

Other sources of nitrogen are fish manure, cotton-seed meal, oil cakes, meatworks manure, &c.

An *excessive application* of nitrogenous manure may act sometimes in a detrimental manner by producing a too luxuriant growth of foliage and tops, and reducing the yield of grain, fruit, or tubers. Such bad effects are counteracted by the addition of fertilisers containing potash and phosphoric acid.

Potash is an important constituent of all plants, and is found most abundantly in the young leaves and twigs, as it is intimately connected with the production of starch and sugar in the leaves and the subsequent transference of these bodies to fruit, tubers, &c.

Many of our soils are rather deficient in potash, and the mineral plant food is, therefore, of particular importance to farmers.

Sulphate of potash, or potassium sulphate, is the most concentrated form in which potassium is used as a fertiliser, as the salt contains about 50 per cent. of potash, in a very soluble and readily available form. This salt is easily handled, and can be mixed with all fertilisers, and can be applied at any time.

In the case of a few crops, for instance for bananas and potatoes, other commercial forms of potash manure—viz., *muriate of potash*, which contains from 50 to 60 per cent. of potash, and kainit, which contains an average of 12½ per cent. of potash—can be used with advantage instead of sulphate of potash.

Wood ashes—particularly the ash of lantana, tobacco leaves and stalks, coffee berry pulp—contain a fairly large amount of potash. The ashes of our native timbers contain as a rule only small amounts of potash.

Phosphoric acid is the third important constituent of artificial fertilisers, and found therein in the form of its salts, called *phosphates*. Phosphoric acid appears

necessary to the general nutrition of all plants, and hastens their maturity. No plant could produce seeds without a sufficient supply of phosphoric acid. It also aids in the assimilation of other compounds, and aids in the production and transport of the nitrogenous compounds in plant cells.

Practically the majority of our soils are deficient in phosphoric acid, and more particularly the red volcanic soils are deficient in the readily available soluble form of phosphates, although the total amount present may be fairly high.

Phosphoric acid in the form of *Phosphate of Lime* is the principal constituent of the bones and teeth of animals; and bones, in one form or another, therefore, form the chief supply of phosphoric acid in artificial fertilisers.

Superphosphates, obtained by treating either bones phosphates or mineral phosphates with strong sulphuric acid, contain from 17 to 19 per cent. of water soluble phosphoric acid, and in a special form of concentrated superphosphates up to 40 per cent.

When applied to the soil, the water soluble form of phosphoric acid will gradually change into a less soluble form, and this change is fairly rapid in our red soils rich in iron.

For soils inclined to be acid, superphosphates are not so suitable, and the phosphoric acid is generally supplied in form of *basic slag,* or *Thomas's phosphate,* which contains the phosphoric acid in a form insoluble in water, but readily soluble in weak organic acids like citric acid.

Thomas's phosphate is at the present day being replaced by the artificial fertiliser *basic superphosphate,* which contains about 18 per cent. of citrate soluble phosphoric acid, and is therefore an excellent substitute for superphosphates in soils where the superphosphate would change into soluble phosphates.

For most of our crops, and particularly those grown on red volcanic soil, the use of *crushed rock phosphate,* like Holbourne Island phosphate, will be found very suitable, supplying not only phosphoric acid in citrate soluble form, but also lime.

Bonemeal, or *bonedust,* contains from 20 to 25 per cent. of phosphoric acid in form of lime phosphate insoluble in water or weak acids, which, therefore, becomes available very slowly. Bonemeal generally contains from 3 to 5 per cent. of nitrogen, which makes this manure more valuable.

When studying the *requirements of fertilisers* of any crop, the nature of the soil has to be taken carefully into account. There may be a sufficiency of total plant foods, as disclosed by the ordinary agricultural chemical analysis of the soil, but they may be in a *very unavailable* form. Again, small quantities of plant foods, which may be quite sufficient for the crop in a light, friable, sandy soil which promotes a prolific root growth, may be quite insufficient in a heavy, clayey soil.

As a general rule, it is much better to divide the total amount of fertiliser necessary for the crop into *two* or *more dressings* during the growth of the crop.

Most *farm crops* and particularly *vegetables,* which are, as a rule, gross feeders, will benefit by two or more dressings of artificial fertilisers.

For the application of artificial fertilisers calm and cool days should be selected, and the application made, if possible, just before or after rain.

Heavy applications of chemical manures should never come into direct contact with the roots of plants, but *should be well mixed with the soil.*

TABLE OF EQUIVALENT QUANTITIES OF MANURES.

Per Acre.	Approximate Quantity per Perch.	Approximate Quantity per Square Yard.	Per Acre.	Approximate Quantity per Perch.	Approximate Quantity per Square Yard.
1 ton ..	14 lb.	7½ oz.	2 cwt. ..	1¼ lb.	..
10 cwt. ..	7 lb.	3¾ oz.	112 lb.—1 cwt.	11¼ oz.	..
5 cwt. ..	3½ lb.	1¾ oz.	84 lb. ..	8½ oz.	..
4 cwt. ..	2¾ lb.	..	56 lb. ..	5½ oz.	..
3 cwt. ..	2 lb.	..	28 lb.	3 oz.	..

1 Teaspoonful = about ½ oz.

Farm Notes for May.

FIELD.—May is usually a busy month with the farmer—more particularly the wheatgrower with whom the final preparation of his land prior to sowing is the one important operation. Late maturing varieties should be in the ground by the middle of the month at the latest.

Clover land, intended primarily for feeding off, should be sown not later than the end of April.

The necessity of pickling all wheat intended for sowing purposes is again emphasised; and for general purposes, combined with economy in cost of material, the bluestone and lime solution holds its own. To those who desire an easier but somewhat more costly method of treatment, carbonate of copper at the rate of 1 oz. to the bushel and used in a dry form is suggested.

Potatoes, which in many districts are still somewhat backward, should have by this time received their final cultivation and hilling-up.

The sowing of prairie grass on scrub areas may be continued, but should be finished this month. This is an excellent winter grass, and does well in many parts of Southern Queensland.

Root crops, sowings of which were made during April, should now receive special attention in the matter of thinning out and keeping the soil surface well tilled to prevent undue evaporation of moisture.

Every effort should be made to secure sufficient supplies of fodder for stock during the winter, conserved either in the form of silage or hay.

Cotton crops are now fast approaching the final stages of harvesting. All consignments to the ginnery should be legibly branded with the owner's initials. In this matter the consignor is usually most careless, causing much delay and trouble in identifying parcels, which are frequently received minus the address labels.

Orchard Notes for May.

THE COASTAL DISTRICTS.

In these notes for the past two months the attention of citrus-growers has been called to the extreme importance of their taking every possible care in gathering, handling, packing, and marketing, as the heavy losses that frequently occur in Southern shipments can only be prevented by so treating the fruit that it is not bruised or otherwise injured. It has been pointed out that no citrus fruit in which the skin is perfect and free from injury of any kind can become speckled or blue-mouldy, as the fungus causing the trouble cannot obtain an entry into any fruit in which the skin is intact. Growers are, therefore, again warned of the risk they run by sending blemished fruit South, and are urged to exercise the greatest care in the handling of their fruit. No sounder advice has been given in these notes than that dealing with the gathering, handling, grading, packing, and marketing, not only of citrus, but of all other classes of fruit.

It is equally important to know how to dispose of fruit to the best advantage as it is to know how to grow it. To say the least, it is very bad business to go to the expense of planting and caring for an orchard until it becomes productive and then neglect to take the necessary care in the marketing of the resultant crop. Main crop lemons should be cut and cured now, instead of being allowed to remain on the tree to develop thick skins and coarseness. As soon as the fruit shows the first signs of colour or is large enough to cure down to about from 2¼ to 2½ in. in diameter, it should be picked, care being taken to handle it very gently, as the secret of successfully curing and keeping this fruit is to see that the skin is not injured in the slightest, as even very slight injuries induce decay or specking. All citrus fruits must be sweated for at least seven days before being sent to the Southern States, as this permits of the majority of specky or fly-infested fruits being rejected. Citrus trees may be planted during this month, provided the land has been properly prepared and is in a fit state to receive them; if not, it is better to delay the planting till the land is right.

In planting, always see that the ground immediately below the base of the tree is well broken up, so that the main roots can penetrate deeply into the soil and not run on the surface. If this is done and the trees are planted so that the roots are given a downward tendency, and all roots tending to grow on or near the surface are removed, the tree will have a much better hold of the soil and, owing to the absence of purely surface roots, the land can be kept well and deeply cultivated, and be thus

able to retain an adequate supply of moisture in dry periods. Do not forget to prune well back when planting, or to cut away all broken roots.

All orchards, pineapple and banana plantations should be kept clean and free from all weed growth, and the soil should be well worked so as to retain moisture.

Custard apples will be coming forward in quantity, and the greatest care should be taken to see that they are properly graded and packed for the Southern markets, only one layer of one sized fruit being packed in the special cases provided for this fruit—cases which permit of the packing of fruit ranging from 4 to 6 in. diameter in a single layer.

Slowly acting manures—such as meatworks manure—may be applied to orchards and vineyards during the month; and lime can be applied where necessary. Land intended for planting with pineapples or bananas during the coming spring can be got ready now, as, in the case of pineapples, it is a good plan to allow the land to lie fallow and sweeten for some time before planting; and, in the case of bananas, scrub fallen now gets a good chance of drying thoroughly before it is fired in spring, a good burn being thus secured.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

Clean up all orchards and vineyards, destroy all weeds and rubbish likely to harbour fruit pests of any kind, and keep the surface of the soil well stirred, so as to give birds and predaceous insects every chance to destroy any fruit fly pupæ which may be harbouring in the soil. If this is done, many pests that would otherwise find shelter and thus be able to live through the winter will be exposed to both natural enemies and cold.

Further, it is a good plan to clean up the land before pruning takes place as, if delayed till the pruning has been finished, the land is apt to dry out in a droughty season.

Pruning can be started on such varieties as have shed their leaves towards the end of the month, as it is a good plan to get this work through as early in the season as possible, instead of putting it off until spring. Early-pruned trees develop their buds better than those pruned late in the season. These remarks refer to trees—*not vines,* as the later vines are pruned in the season, the better in the Granite Belt district, as late-pruned vines stand a better chance to escape injury by late spring frosts.

All worthless, badly diseased, or worn-out trees that are no longer profitable, and which are not worth working over, should be taken out now and burnt, as they are only a menace and a harbour for pests.

Land intended for planting should be got ready as soon as possible, as, if ploughed up roughly and allowed to remain exposed to the winter frosts, it will become sweetened and the trees planted in it will come away much better than if set out in raw land. In any case the land must be properly prepared, for once the trees are planted it is a difficult matter to get the whole of the land as well worked as is possible prior to planting.

Slowly acting manure—such as ground island phosphates or basic phosphates—may be applied to orchards and vineyards. They are not easily washed out of the soil, and will become slowly available and thus ready for use of the trees or vines during their spring growth. Lime may also be applied where necessary.

This is a good time to attend to any drains—surface, cut-off, or underground. The two former should be cleaned out, and in the case of the latter all outlets should be examined to see that they are quite clear and that there is a good getaway for the drainage water. New drains may also be put in where required.

In the warmer parts citrus fruits will be ready for marketing, and lemons ready for cutting and curing. The same advice that has been given with respect to coast-grown fruit applies equally to that grown inland; and growers will find that careful handling of the fruit will pay them well. Lemons grown inland are, as a rule, of superior quality to those grown on the coast, but are apt to become too large if left too long on the trees, so it is advisable to cut and cure them as soon as they are ready. If this is done and they are properly handled, they may be kept for months, and will be equal to any that are imported.

If the weather is very dry, citrus trees may require an irrigation, but, unless the trees are showing signs of distress, it is better to depend on the cultivation of the soil to retain the necessary moisture, as the application of water now is apt to cause the fruit to become soft and puffy, so that it will not keep or carry well.

Land intended for new orchards should be got ready at once, as it is advisable to plant fairly early in the season in order that the trees may become established before the weather again becomes hot and dry. If the ground is dry at the time of planting, set the trees in the usual manner and cover the roots with a little soil; then give them a good soaking; and, when the water has soaked into the soil, fill the hole with dry soil. This is much better than surface watering.

ASTRONOMICAL DATA FOR QUEENSLAND.

Times Computed by D. EGLINTON, F.R.A.S., and A. C. EGLINTON.

TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

	April, 1930.		May, 1930.		MOONRISE. April, 1930.	MOONRISE. May, 1930.
Date.	Rises.	Sets.	Rises.	Sets.	Rises.	Rises.
					a.m.	a.m.
1	6.5	5.46	6.21	5.17	7.34	8.33
2	6.5	5 45	6 21	5.17	8.33	9.36
3	6.6	5.44	6 22	5.16	9.38	10.40
4	6 6	5.43	6.22	5 16	10.41	11.41
5	6 7	5.42	6.23	5.15	11.45	p.m. 12.35
6	6.7	5.41	6.23	5 14	p.m. 12.47	1.21
7	6.8	5.40	6.24	5.14	1.45	1.57
8	6.8	5.39	6.25	5.13	2.37	2.32
9	6 9	5.38	6.25	5.13	3 21	3.6
10	6.10	5.37	6 26	5.12	3 58	3.38
11	6 10	5 36	6 27	5.11	4.43	4 10
12	6 11	5.34	6.27	5.11	5.7	4.45
13	6.11	5 33	6.28	5.10	5 39	5.23
14	6.12	5 32	6.28	5.10	6.14	6.9
15	6.12	5.31	6 29	5.9	6.50	6.58
16	6.13	5.30	6.30	5.8	7.30	7.50
17	6.13	5.29	6 30	5.8	8.17	8.44
18	6.14	5.28	6 31	5.7	9.7	9.39
19	6.14	5.27	6 31	5.7	9.59	10.35
20	6.15	5.26	6.32	5.6	10.56	11.31
21	6.15	5.26	6.33	5.6	11.51	...
22	6.16	5.25	6.33	5.5	...	a.m. 12.11
23	6 16	5.24	6.34	5.5	a.m. 12.45	1.18
24	6.17	5.23	6.35	5.4	1.39	2.12
25	6.17	5.22	6.35	5.4	2.34	3.8
26	6.18	5.21	6.36	5.3	3.29	4.6
27	6.18	5.21	6.36	5.3	4.25	5.8
28	6.19	5.20	6.37	5.2	5.23	6.16
29	6.19	5.19	6.38	5.2	6.23	7.22
30	6.20	5.18	6.38	5.1	7.26	8.29
31	...	...	6.39	5.1	...	9.32

Phases of the Moon, Occultations, &c.

6 April	☾	First Quarter	9 24 p.m.
13 ,,	○	Full Moon	3 48 p.m.
21 ,,	☽	Last Quarter	8 8 a.m.
29 ,,	●	New Moon	5 8 a.m.

Perigee, 9th April, at 9.12 p.m.
Apogee, 21st April, at 10·54 p.m.

On the 9th at 10 p.m. Neptune will be 4 degrees south of the Moon, but will be much more difficult to see than Jupiter.

On 13th April at 4 o'clock in the afternoon the Moon will be undergoing a partial eclipse in the shadow of the Earth, when far below our horizon in Queensland. A fortnight later an extraordinary eclipse of the Sun will take place which will also be invisible in Queensland. It will be seen as a total eclipse at San Francisco and across Southern Canada.

The conjunction of Saturn and the Moon on the 19th will take place when both are far below the horizon.

Mercury and Venus will be technically in conjunction on the 22nd, but not favourably situated for observation.

The Moon will be passing from the west to the east of Mars on the 25th at 7 a.m. when invisible.

Mercury will reach its greatest distance, 20 degrees east of the Sun, on the 27th, it will then be at a sufficient height above the western horizon at sunset to afford opportunities for seeing it somewhat later; Venus, however, will be higher up and brighter.

The Southern Cross will be at its greatest height and on the Meridian at Warwick half an hour after midnight on 21st March. It will then be at a height of 58 degrees above the southern horizon (at Warwick). On the 1st April it will reach this position 40 minutes earlier. Four minutes must be added for each degree west of Warwick, or subtracted for Brisbane or any other place on the same Meridian, 153 degrees east of Greenwich. Subtract four minutes for each day after the 21st of March.

6 May	☾	First Quarter	2 53 a.m.
13 ,,	○	Full Moon	3 29 a.m.
21 ,,	☽	Last Quarter	2 21 a.m.
28 ,,	●	New Moon	3 36 p.m.

Perigee, 5th May, at 4.48 a.m.
Apogee, 19th May, at 5.54 p.m.
Perigee, 31st May, at 3.36 p.m.

At 4 o'clock in the morning of the 7th the Moon will be passing Neptune, four degrees away on its northern side.

On the 12th Mars will be passing from west to east of Uranus, at apparently the distance of only one diameter of the Moon. A telescope or binoculars will be necessary to see the larger and much more distant planet Uranus. They will be well above the eastern horizon about an hour before sunrise.

For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S., add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhat about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

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Event and Comment.

Anzac.

THE fifteenth anniversary of the Epic of Gallipoli, 25th April, was commemorated fitly, amply, and reverently throughout the Commonwealth; and also in those far countries where, with their comrades of New Zealand, Great Britain, and other parts of the Empire, the Australian volunteer soldier won lasting fame. The spirit of that great day was expressed in an inspiring message from Sir John Monash, the Australian Corps Commander, in the course of which he said:—

> Engraved in the heart of every true Australian is the memory of those brave men who, on far-off fields of battle, put the seal on Australia's honour and nationhood with their lives.
>
> With a common impulse, therefore, the people, as a nation, pause each year to pay their tribute of remembrance, and to commemorate, in a spirit of love and gratitude, the heroism and sacrifice of those who did not return. Each year finds this sentiment perhaps deeper and more abiding, because time, which proves all things, confirms the debt we owe to those who fought so valiantly and died so nobly in their country's cause.
>
> Deep as may be the sorrow, there is also the feeling of pride that on Anzac Day fifteen years ago Australians faced their grim baptism of fire, in one of the most hazardous adventures in history, with a dash and daring and abandon of courage that earned them enduring fame against the background of years.
>
> The message of Anzac Day stands out in shining letters. It is courage and fortitude. To-day, when the problems of peace, some of them the aftermath of the war, press so heavily on us as a people, it should be our inspiration. Not only should we follow the precept, but also the example set by our soldiers, who never wavered, but always did their best in a weary war of attrition and endurance. They ended as they started, never thinking of defeat, but only the objective to be won.

The Australian Spirit.

THE spirit of Anzac existed before Gallipoli, but first found adequate expression there. It still existed as the spirit of Australia at all times, through prosperity and stress, through drought, fire, and flood, inspiring the nation with the eternal hope of better things. Those ideas formed the keynote of a fine address by Colonel F. M. de F. Lorenzo, before an Anzac Day audience. The spirit of a nation, he said, was formed usually by centuries of trial, and became the soul of its traditions and an integral part of the life of the people. The spirit of Anzac was not merely the spirit which actuated the troops at Gallipoli to do the seemingly impossible, but a spirit which had existed before the name Anzac was coined. Before Australians achieved feats unprecedented in the history of war the spirit of Anzac had turned impenetrable forest and scrub into farms and deserts into crop lands. It was born in the pioneers, fighting against nature in fire, flood, and drought. Men were ruined in single seasons or single nights, and came up smiling, prepared to ''scrap'' once more with the almost impregnable forces of nature.

Notwithstanding this record of heroism Australians had not until recent years any really national traditions. Their forefathers had brought with them the traditions of the homeland, and these were accepted because their sons had none of their own. Australia had assisted in various small military campaigns and sent troops to aid Empire causes, but there was no real call for help until 1914. Then 30,000 Australian men of all occupations, professional men and labourers, squatters and shearers, for physique, brains, and initiative unparalleled in the world, embarked for a destination and adventures unknown. They were a magnificent body of men, but still were not the fighting unit they were to become—the pride of the world.

In Egypt, away from their own people and among half a dozen languages, the barriers of State units were broken down, and they became an Australian community, finding their nationality. Though there was no doubt as to the individual bravery of the men, demonstrated in brushes with the military police and in daily climbing of unclimbable pyramids, the question arose as to whether or not they could stand the hell of war. At Gallipoli they achieved the impossible in war by landing, and again by staying until they left of their own accord.

The gibes of lack of discipline among the Australian troops could be hurled back in the faces of those who uttered them. The discipline of Gallipoli was peculiar and exacting. Without marvellous discipline the Gallipoli landing, occupation, and evacuation never could have been achieved.

It was essential that one spirit should actuate all the troops in that campaign, and the spirit of Anzac, which had existed before in Australians without a name, there found its outlet. If all the meritorious deeds of the campaign received their full recognition hardly a man on Gallipoli would have been without some military honour. So common were they that innumerable heroic deeds received no recognition. He had seen a shell land in an ammunition dump. The crew of three were all injured, and the dump caught fire. Two infantrymen rushed over to put the fire out before the dump exploded, and rescued the three injured men. The incident was reported, and only one military medal was allowed as its recognition.

In France the same spirit actuated all other Australian troops. They fought beside the flower of the British Army and against the flower of the Germans, and at no time did the efficiency and fighting prowess of either cause any quickening of their pulse. If they knew they were against the Prussian Guards, they were ''on their toes for the fight, and they beat them every time they touched them.''

The same spirit, the speaker ended, animated Australia at all times, through all depression and difficulties as well as in prosperity. It was the strength and glory of the nation.

Soil Problems.

THE third annual report of the Council for Scientific and Industrial Research which has just come to hand is a very interesting document. It gives an excellent idea of the scope and value of the investigations of the Council. Regarding soil problems, for instance, we learn that in 1927 the Council entered into a co-operative agreement with the University of Adelaide for investigations to be carried out at the Waite Agricultural Research Institute on soil problems, particularly in the Murray River Valley Irrigation Settlements. The investigations were placed under the control of Professor J. A. Prescott, who was appointed as adviser to the Council on soil problems. This action was taken as a result of the realisation of the importance of greater co-ordination in the investigation of soil problems throughout the Commonwealth.

The development of laboratory technique and the application of modern methods to Australian problems had already become part of the policy of the Department of Agricultural Chemistry of the Waite Institute when action was taken by the Council in 1927 for the study of soil problems in co-operation with that institute. The development of internationally recognised methods under the auspices of the International Society of Soil Science and the creation of the Imperial Bureau of Soil Science have made the present time singularly opportune for securing co-ordination throughout the Commonwealth.

Before similar co-ordination is possible on the field side, much investigation remains to be done, but the work already carried out in the irrigation settlements has enabled a field technique to be developed on a satisfactory basis and will lead the way for similar detailed work in other parts of Australia.

As part of the soil survey work, an aerial photographic survey of the whole of the Renmark Settlement has been carried out by officers of the Royal Australian Air Force with a view to ascertaining whether the known differences of soil types can be identified in the photographs. If so, it is intended to make use of the information thus obtained in completing the survey of the Renmark Settlement.

Possibilities of co-ordination in broader aspects of soil survey work in Queensland have also been explored, but no definite steps have yet been taken.

Tuberculous Milk and Pigs—An Interesting Test.

FOLLOWING on instructions issued by the Minister of Agriculture and Stock, Mr. Walker, the Government Bacteriologist, Mr. C. J. Pound, conducted at the Stock Experiment Station, Yeerongpilly, recently certain experiments with the feeding of tuberculous milk to young pigs.

Six young pigs were obtained and were subjected to the tuberculin test. All of them gave negative results. Three of these pigs were then fed on untreated milk from a known tuberculin cow, while the other three pigs were fed on pasteurised milk from the same cow. Subsequently, the whole six pigs were sent to a bacon factory and slaughtered in the presence of the manager, two meat inspectors, and Mr. Pound. The three pigs fed on the untreated milk all showed tubercular lesions (generalised), while the three pigs fed on pasteurised milk proved perfectly healthy.

Concurrently, Mr. Pound made certain investigations into the matter of the resistance of tubercle bacilli in bacon to the curing process, salting, and smoking. The salting and pickling of meat is generally accredited with great efficacy, but a closer examination reveals that an essential part of the bacon-curing process is the withdrawal of water from the meat, so that any micro-organisms that may be present in, or subsequently conveyed to the flesh, are only prevented from reproduction. Consequently the germs, especially those of a resistent nature like tubercle bacilli, cannot be completely destroyed by these processes.

Freytag has proved that the influence of a concentrated solution of common salt is resisted by tubercle bacilli for three months.

In the Yeerongpilly experiments, which are still in progress, we have so far proved that tubercle bacilli in the lymphatic glands of a pig kept in freshly prepared curing brine retain their vitality and virulence for forty-eight days—i.e., portion of salted tuberculous glands injected into guinea pigs produced tuberculosis.

Smoking dries the surface and impregnates the bacon with traces of acetic acid, formaldehyde, and creosote. Although the two former volatilise from the food, the surface retains some of the creosote. Smoking has only a surface preservative action, and does not reach the interior, so that pathogenic organisms like the tubercle bacilli, which may be present in the lymphatic glands, remain undestroyed and for some considerable time retain their virulence.

I. Forster found that the flesh of a pig affected with tuberculosis contained tubercle bacilli in a state of undiminished vigour after immersion for a month in brine, followed by careful smoking for fourteen days.

Tuberculosis material from pigs condemned for tuberculosis was subjected to the ordinary routine curing process of salting and smoking, the time occupied in the process being approximately seven weeks.

Fifteen days after the completion of the curing process a microscopical examination of these specimens revealed the presence of tubercle bacilli, and the vitality and virulence of these organisms was not noticeably affected by the curing process, for guinea pigs inoculated with this material developed tuberculosis.

It is to be remembered that the Yeerongpilly tests are not necessarily conclusive, and the foregoing is primarily in the nature of a progress report. Experiments are still in progress to ascertain the maximum period that tubercle bacilli will retain their vitality in cured tuberculous bacon.

THE QUEENSLAND SUGAR INDUSTRY.

By H. T. EASTERBY, Director of Sugar Experiment Stations.

PART V.

(b) Review of the Industry since Federation.

(Continued.)

THE question of the best means of carrying on the sugar industry in Queensland and New South Wales by white labour early engaged the attention of the first Commonwealth Parliament, and much thought was devoted to the method. The first thing to be done was to carry out the wishes of Australia generally that the Pacific Island labour should be discontinued. The idea of carrying on the sugar industry by white labour only was at that time in the nature of a huge experiment, and there were plenty of people shouting that it would fail, that no country in the world had ever attempted to grow cane by white labour and no country could. They visaged the complete ruin of the cane sugar industry in Australia, as the result.

The first Act passed by the Commonwealth Government in relation to the sugar industry (and it may be pointed out that there were thirteen Acts from 1901 to 1912) was an Act to provide for the regulation, restriction, and prohibition of labour from the Pacific Islands. It was enacted that no Pacific Island labourer should enter Australia after the 31st March, 1904, and that none should enter before 1904 without a license. During 1902, the entries were to be restricted to not more than three-quarters of the number who returned to their native islands in 1901, and during 1903 to not more than one-half of those who had so returned during 1902. No agreement for island labour was to be made or remain in force after the end of 1906. If any Pacific Islanders were found after the end of 1906 they were to be deported. An amendment to this Act was later passed, which provided that certain Pacific Islanders, such as those that had entered Australia prior to September 1879, or were of extreme age, were married, or who were in possession of freehold land, or those whose lives might be imperilled on landing on the islands, &c., could be granted certificates exempting them from deportation.

The methods for encouraging the canegrowers to employ only white labour were by means of conditions set out in the *Excise Tariff Act of* 1902. An excise of 3s. per cwt. or £3 per ton on manufactured sugar was imposed up till 1st January, 1907, less from the 1st July, 1902, a rebate of 4s. or £2 per ton on all sugar-cane delivered for manufacture in the production of which white labour only had been employed after the 28th February, 1902. The rebate was calculated on cane giving 10 per cent. of sugar, and was equivalent to £2 per ton of sugar. This rebate was to be increased or reduced according to any variation from the standard, and all rebate was to be allowed at the time of delivery of the cane.

While the amount of excise on sugar remained the same, the rebate was abolished in July, 1903, by an Act to provide for a bounty on sugar, which provided for a payment out of consolidated revenue to every grower of sugar-cane in the production of which only white labour had been employed after the 28th February, 1903 (or for a period of twelve months immediately preceding the delivery thereof), on all cane delivered for manufacture. The rate of the bounty was 4s. per ton of cane calculated as in the previous Act—viz., on cane giving 10 per cent. of sugar, and to be increased or reduced according to variation from standard. The regulations to this Act set out that the average sugar-giving contents of cane produced in each district and the consequent rates of bounty per ton of cane should be deemed to be according to the scale below for the year commencing 1st June, 1903, and for every subsequent year till altered:—

Name of District.	Average number of tons of cane to make one ton of sugar.	Average sugar-giving contents of cane.	Rate of Bounty per ton of cane.
		Per cent.	*s.* *d.*
No. 1 District	8·0	12·5	5 0
No. 2 District	8·57	11·66	4 8
No. 3 District	9·22	10·84	4 4
No. 4 District	10·0	10·00	4 0

No. 1 District embraced all that portion of Queensland north of the 19th degree of south latitude—viz., from the Herbert to Mossman.

No. 2 District.—Between 19th and 23rd degrees south latitude, embracing from Townsville to Mackay.

No. 3 District.—Between 23rd and 26th degrees south latitude, from Yeppoon to Tiaro, taking in Bundaberg, Childers, Maryborough, &c.

No. 4 District.—Between 26th degree of south latitude and the border of New South Wales, taking in Gympie, Moreton, Logan, and Albert, &c.

In 1905, in view of the fact that the Act providing for the payment of bounty on sugar was to expire in 1907, proposals were made relating to an extension of same. The then Minister of Trade and Customs for the Commonwealth (Sir William Lyne) made inquiries in connection with further expediting and maturing Federal legislation relating to the placing of the sugar industry of Australia upon a basis of exclusive white labour production. Dr. Maxwell, then Director of Sugar Experiment Stations in Queensland, was asked to reply to certain questions.

The first question was—For what further period does it appear necessary to extend the system of paying bonus on white-grown cane? In his reply to this the Director stated that three years had elapsed since the introduction of the Commonwealth legislation. The total number of canegrowers in Queensland in 1905 was estimated to

be 3,422, and the number of white growers out of this total was 2,681, or 78 per cent. of the whole. Although the number of farmers producing cane grown by white labour had largely increased, yet the figures did not necessarily convey a correct indication of the actual progress that white cane production had made to date, as the crop of 1904 was comprised as under:—

1. Black-grown cane, 947,105 tons, or 71·38 per cent.

2. White-grown cane, 379,884 tons, or 28·62 per cent.

These figures showed that at the end of the third year's operations less than one-third of the sugar production in Queensland was eligible for the bonus, although it was anticipated that the 1905 crop would show a slight increase of over a third.

The increase in the number of white growers had been mainly in the Southern and Central districts, and up to that time only small relative progress had been made in the tropical North. The Central and Southern districts were those of the closest settlement and of the more temperate climatic conditions. The earliest registrations for white-grown cane included farmers on the smallest areas. During the following two years, growers upon somewhat larger areas were able to enter upon conditions of white production. The remaining black-grown sugar areas were in the hands of some 750 large growers in the Northern districts, and by plantation owners in the Southern, or district of Bundaberg.

As to what further period it would be necessary to extend the payment of bonus, it was thought that a period of less than five years would not furnish security to nor induce owners or occupants of the larger areas to undertake the changes in expenditures, such as cutting up their estates and putting up buildings for settlers, that would attach to a conversion from black to white production. An extension for a period of seven years could claim the largest measure of support, providing the greatest security and advantage to all interests concerned.

The second question put was—Should the bonus continue to be paid in its present amount, or are there reasons for a revision? The reply to this was that, as the cost of labour had gone up since 1902, and with the progress of white production white labour would continue to command a higher compensation in the form of wages and better domestic provisions, the existing measure of bonus must, therefore, tend to fall below and not to exceed the cost of substituting white for coloured labour.

In reply to Question 3—Should a reducing scale be adopted with a view to the gradual diminution and extension of the bonus? The reply was that the measure of achievement had not yet been reached that would render the adoption of a reducing scale applicable to the situation at this time. To enforce its adoption prematurely can undo the present success and threaten the future promise that waits upon the experiment.

Question 4—Are there any reasons for a revision of the present rate of import duty? Reply—The measure of protection afforded to the home industry should be that amount which is indispensable to maintain same using the most modern means of producing against the foreign producers. If the measure of protection is raised to enable the home producer to continue to compete by the use of obsolete methods, a tribute is offered to ignorance and stagnation, with no gain to such home producer but at an unwarranted additional cost to the consumer. The present rate of import duty is £6 per ton as compared with the duty of approximately £9 per ton upon foreign sugars entering the United States of America, in which country no excise upon home-grown sugars exists. The present duty, although low, when compared with rates of duty operating in some other countries, appears to be adequate for its purpose.

Question 5—What are the foreseen effects of an increase of the excise duty? Reply—If an increase in the excise with a corresponding increase of bonus is made, it is likely to induce or force an immediate substitution of white for coloured labour in those districts where the natural and economic conditions allow at once of the change.

In concluding his remarks, Dr. Maxwell said:—

> "The undertaking of substituting white for coloured labour and of placing a tropical industry upon a basis of white production constitutes a *great experiment.* The experiment and its execution traverses natural and economic conditions that have to be consulted at every step. So far as the persons engaged in the industry are a factor, if they cannot be induced to aid the experiments by giving it a full and unbiassed trial, means may be proposed to secure their co-operation by pressure. The paramount demand of the experiment is that it shall succeed, and this requires that the fullest details of its nature, of its mode of operation, and of its ultimate probable effects shall be understood; and with these, the greatest patience, discrimination, and care in carrying the experiment out to its end."

As the result of these and other inquiries and the desire of the Commonwealth to hasten, if possible, the substitution of white for coloured labour, the *Sugar Bounty Act of* 1905 was passed. In this Act "white-grown cane" was defined as sugar-cane produced on a white plantation and in the production of which white labour only had been employed. It was provided that after 1st January, 1907, a bounty of 6s. per ton, calculated on cane giving 10 per cent. of sugar, to be increased or decreased according to variation from standard should be paid. The grower was obliged to certify to the rates of wages paid to any labour employed by him other than members of his own family.

An *Excise Tariff Act of* 1905 fixed the excise at 4s. per cwt. as from 1st January, 1907, up till 1911.

By these Acts the excise on sugar was increased, but that produced by white labour received a higher bounty. These rates were equivalent to £4 per ton excise and £3 per ton bounty, and for the respective cane districts worked out as follows:—

Name of District.	Average number of tons of cane to make one ton of sugar.	Average sugar-giving contents of cane.	Rate of bounty per ton of cane.
		Per cent.	s. d.
No. 1 District	8·00	12·5	7 6
No. 2 District	8·57	11·66	7 0
No. 3 District	9·22	10·84	6 6
No. 4 District	10·00	10·00	6 0

This had the effect of still further increasing the proportion of white-grown sugar. By 1908, white labour was producing 87·89 per cent. of the Queensland sugar crop.

Subsequent Acts in relation to the bounty and excise came into force in 1910, but these did not alter the amounts collected as excise or paid as bounty. It had been intended that the excise to be collected and the bounty to be paid in 1911 and 1912 should be two-thirds and one-third of the existing rates, but these clauses in the Sugar Excise and Bounty Acts of 1905 were to be omitted. Further conditions were embodied in the 1910 Sugar Bounty Act as to rates of wages and conditions of employment, setting out that the Minister might withhold the bounty if he found that the rates of wages and conditions of employment, or any of them, were below the standard rates and conditions of employment prescribed by any Commonwealth or State Industrial Authority, or, in the absence of any such standard applicable to the case, were below the standard rates payable and conditions of employment obtainable in the locality in which sugar is grown, or, in the absence of any such standard, are on application by the Minister to the President of the Commonwealth Court of Conciliation and Arbitration declared not to be fair and reasonable by him or by a Judge of the Supreme Court of a State, or any person or persons who compose a State Industrial Authority to whom he might refer the matter.

The question of wages to be paid to white labourers in the industry was one that exercised the Commonwealth Government from 1905 on to the end of the bounty system. In 1907, the Acting Minister for Trade and Customs stated that if the rates paid were not less than those mentioned below the payment of bounty would not be imperilled:—

	Per week and found.
During off season	22s. 6d.
For harvesting	25s.
Boys under 16	10s. to 15s.
Youths from 16 to 18	15s. to £1
Old, infirm, or non-ablebodied workers	15s. to £1

In all cases where employees were not "found," the weekly wage to be 10s. extra.

No deductions for keep from weekly wages to be made on account of wet weather; hours of labour from 50 to 60 per week.

Contract rates to be such as were mutually agreed upon between employers and employees, provided such rates were not less than an equivalent to the weekly rates above mentioned.

In 1912, fresh regulations were issued increasing the minimum rates of wages that had to be paid if bounty were to be claimed. These were as follows:—

	Per week.
Adult Labour—	
With keep	£1 16s.
Without keep	£2 8s.
Youths—	
From 16 to 18 with keep	£1 4s.
Under 16 with keep	£0 16s.

Old, infirm, or non-ablebodied men and full-bred aboriginals, £1 4s. per week with keep.

Hours of labour, 48 per week.

Where remuneration does not include keep, the value of such keep to be considered as 12s. per week; overtime for adults 1s. per hour, and 8d. per hour for youths from 16 to 18 years, and 6d. for youths under 16.

By 1912, practically all the cane was being grown by white labour, and a feeling was being manifested that the industry would be better off under State control than under that of the Commonwealth. This question gave rise to violent discussions and was freely debated for some time. The change over to State control will be dealt with in the next article.

[TO BE CONTINUED.]

Readers are reminded that a cross in the prescribed square on the first page of this "Journal" is an indication that their Subscription —one shilling—for the current year is now due. The "Journal" is free to farmers and the shilling is merely to cover the cost of postage for twelve months. If your copy is marked with a cross please renew your registration now. Fill in the order form on another page of this issue and mail it immediately, with postage stamps or postal note for one shilling, to the Under Secretary, Department of Agriculture and Stock, Brisbane.

Bureau of Sugar Experiment Stations.

ENTOMOLOGICAL HINTS TO CANEGROWERS.

By EDMUND JARVIS.

These monthly hints were first commenced by the writer in November 1923; the present issue—dealing with farming activities for the month of April—being the seventy-seventh publication of such advice notes, which describe the various insect pests of sugar-cane likely to be met with just now, how to recognise same, and approved methods for combating them. In publications of this nature it is impossible to altogether avoid a certain amount of repetition, seeing that many of the species of insects occurring, for example, during the present month of April will probably cause similar injuries to cane a year hence.

The main object aimed at, however, is to jog the memory of our growers at the critical time, when the enemy is likely to be in evidence amongst their crops.

In the case of insidious attacks from those insects which work in the dark, as it were, either in the middle of the sticks or in the basal portion of young shoots of plant or ratoon cane, it is always well to be forewarned of their presence.

Cane Inspection by the Farmer.

Growers would find it a good plan to make periodical visits of inspection throughout their cane-farms. These should be taken systematically, with view to covering, when possible, the entire area under crop. Each block should be inspected at times when the cane is from 1 to 2 feet high, and again when the sticks are 3 to 4 feet high.

During the former early stage of growth a look-out must be kept for "dead-hearts," which, if present in more than 5 per cent. of the stools, should be brought under the notice of the Entomologist at Meringa Experiment Station ('Phone 95, Gordonvale). This advice applies also to discovery during such field inspection of caterpillars eating the young cane-leaves. Any outbreaks of army worm or grass caterpillars can then be dealt with at once by means of special spraying equipment recently procured for such control work.

On the other hand, when the sticks are well advanced or are nearing maturity, such inspection work should be concentrated for the most part on the bottom of the sticks, from 3 to 12 inches above ground level, for evidence of beetle-borer attack. The presence of this weevil is usually betrayed by small elongate holes of varying shape, from $\frac{1}{16}$ inch wide to $\frac{1}{8}$ to $\frac{3}{8}$ inch in length, which are often edged with dusty matter or grains of excreta, &c., of a lighter colour than the surface of the stick, and suggestive of the boring going on inside. In the event of such damage being noticed in 10 per cent. or more of the sticks, the Entomologist should be advised, in order that steps may be taken to stop further invasion of this formidable weevil-borer.

Bacterial Disease of Grubs.

Be on the look-out for dead or dying cane-grubs exhibiting black blotches on the sides of the body or leg-joints.

These will probably be affected by bacterial disease; but, unlike those attacked by Green Muscardine fungus, instead of hardening internally remain quite flaccid, and finally decompose to a black evil-smelling mass. Growers chancing to notice grubs smitten with bacterial disease are urged to communicate at once with the Entomologist at Meringa.

Clean Cultivation Promotes Successful Fumigation of Cane Grubs.

The advice, "Whatever is worth doing is worth doing well," is familiar to all of us, and applies particularly to those cane farmers who neglect to work their soil sufficiently between the rows of cane. In the case of growers who have more land under crop than they can properly manage such neglect is usually due to want of time, which prevents them from working their cane to the best advantage.

Our chief aim, however, should be to gradually bring the first few inches of top soil into an even friable condition, and this can only be achieved by stirring it at frequent intervals, and whenever the surface becomes caked after heavy rain.

On areas liable to become grub-infested, or thought likely to be attacked by this pest, such cultivation is very important, not merely because tending to destroy a small percentage of the eggs and very young grubs, but also on account of the establishment of those level, uniform, and mechanical conditions of soil porosity which are most suitable for successful operation of the various machines used for the fumigation of cane grubs.

Apart from the question of insect control, such repeated aeration of cane land soon causes it to become "sweet," and renders available abundant plant food for young feeding-roots near the surface. Again, by breaking the surface crust evaporation of moisture is prevented by the mulch so formed, while the water rises and remains at the level occupied by the young roots of the cane.

Collecting Grubs of Cane Beetles.

Every grub of the greyback cockchafer collected by you means about twenty-seven grubs less for next season. This useful work should be kept up during ploughing operations, and constant encouragement given to insectivorous birds to pick up grubs, &c.

At present (May) these larvæ are in the second and third stages of development, and may be recognised by the width across the head, being $\frac{1}{4}$ and $\frac{3}{8}$ of an inch respectively.

It is well to remember that this common-sense method of control for cockchafer grubs is believed in other sugar-growing countries to be very beneficial, and practised as a matter of course. The value of dried grubs of this beetle as a fertiliser is about £11 per ton, which is higher than that quoted for those of the European cockchafer.

Indications of Grub Infestation.

Signs of the presence of these insidious larvæ are likely to become noticeable during the latter half of the present month (May), when cane so injured usually assumes a yellowish tinge, which in severe attacks soon turns brown and withered.

Growers must not be too hopeful of escaping grub damage, as such manifestations will probably be delayed this season owing to the beetles having made a late emergence from the ground.

Occurrence of Green Metarrhizium Fungus.

Grubs killed by this vegetable parasite are usually noticed during the months of April to June. When attacked by this fungus the grub, instead of decomposing, retains its ordinary shape, and gradually hardening turns at first white and then olive green. At this stage it is filled with roots of the fungus, and becoming mummified and of cheese-like consistency can be easily broken into pieces.

Growers would do well to collect all such green crusted-looking grubs, crush them into powder, and thoroughly mix this with about 100 times the quantity of moist, finely-sifted soil.

Such spore-laden earth should then be sprinkled as thinly as possible in the plough furrows when cultivating land known to be liable each season to grub infestation.

CANE PRICES—NEW REGULATIONS.

The Governor in Council has approved of an Order in Council cancelling all previous assignments under the Regulation of Sugar Cane Prices Acts, and substituted fresh ones therefor.

Since the passing of the original Regulation of Sugar Cane Prices Act in 1915, there were made certain assignments of land to the various sugar-mills under the jurisdiction of the Central Sugar Cane Prices Board. The effect of the assignment was to entitle the holder of the land assigned to the benefits of awards in existence with respect to the mill which he supplied with sugar-cane.

These assignments were very wide in so far that whole blocks of land were assigned irrespective of the area of that land which was fit to grow cane. In the new assignments action is taken to define the area to which each grower is entitled

to cultivate and harvest annually. Without an assignment no grower is entitled to the benefits of the award or of the peak year scheme—that is, the scheme adopted by the industry and the Government with respect to the quantity of sugar to be included in the No. 1 Pool—that is, to the benefits of the average of the home consumption and export prices. In other words, any grower outside the peak year scheme is entitled to export prices only.

In the *Gazette* notice issuing the assignments the Minister is intimating that any grower may write to the secretary of the Central Sugar Cane Prices Board, Brisbane, so as to reach him not later than the 15th May, 1930, pointing out any error or anomaly in any assignment. If the Central Sugar Cane Prices Board recommends any alteration of the assignments before the 16th June, 1930, steps will be taken to correct the assignments.

The Central Sugar Cane Prices Board, in preparing the new assignments, generally accepted the position as they found it at the time their secretary made his visit to the various districts—that is say, broadly, the areas recommended were restricted to the actual land under cultivation at this time. This being so, the Board's attitude to the lands now assigned may be gauged by the answers to the following questions raised by the secretary of the Cairns Cane Growers' Association, the answers in question being given below. Exceptions to these answers occurred only in cases where the Board, in their recommendation, have deliberately allowed for the bringing in of new land, as, for instance, in the case of a farmer who has bought in recent years and has had no time to take full advantage of the old assignment.

Question (1).—If a grower cannot make up to his total assignment without clearing more land or without using land that was in process of being cleared in 1927, can he make use of such land?

Answer (1).—No.

Question (2).—If a grower had land under cane in 1927 that was not assigned or permitted by a mill in 1927 and his total recommendation is not sufficient to include his older assigned land and this new land, can he leave out some of the older assigned land and include the newer lands?

Answer (2).—No. This position should not arise.

Question (3).—If a recommendation is made in terms of subdivision 2 of portion 167, total 60 acres, yearly harvest 45 acres, and this subdivision consists of a larger area than 60 acres (say 100 acres), can a grower grow cane on any portion of that subdivision if he has more than 60 acres cleared and fit for growing?

Answer (3).—No.

Question (4).—If a grower starting on new land on a farm prior to 1926 finds that portion of the area selected by him for canegrowing is unsuitable, can he clear a similar acreage in substitution instead of going on with the grubbing and stumping of the old portion?

Answer (4).—No.

Question (5).—If portion of a grower's land on which he has been growing cane is washed away by floods, can he bring in an equal area of new land?

Answer (5).—Not without the permission of the Central Sugar Cane Prices Board.

Question (6).—If a grower finds that the original information tendered by him or on his behalf to the secretary of the Central Cane Prices Board in 1927 is erroneous, can he amend it?

Answer (6).—Yes.

The Board has been asked to assign lands to the Mulgrave Mill for the proposed peak year scheme, but as no Local Board has been constituted and none has been asked for by the mill or the growers, the Board is doubtful as to its powers to make such assignment.

The special *Gazette* which contains the new assignments consists of sixty-four pages and contains the assignments of the following sugar-mills:—Cattle Creek, Macknade, Victoria, Childers, Isis, Babinda, Bingera, Fairymead, Farleigh, Gin Gin, Goondi, Hambledon, Inkerman, Kalamia, Maryborough, Marian, Moreton, Mount Bauple, Millaquin, Mourilyan, Pioneer, Plane Creek, Pleystowe, Proserpine, Qunaba, Racecourse, North Eton, South Johnstone, Invicta, Mossman, and Tully.

LOCAL SUGAR-CANE PRICES BOARDS.

Millowners' Representatives, Canegrowers' Representatives, and Chairmen of the various Local Sugar Cane Prices Boards throughout Queensland have been appointed as under:—

Babinda Local Board—
Millowners' Representatives—F. A. Lamont and W. J. Ryan.
Canegrowers' Representatives—D. O. James and S. H. Warner.
Chairman—A. Anderson.

Bingera Local Board—
Millowners' Representatives—B. A. Bourke and Dr. A. Gibson.
Canegrowers' Representatives—N. Poulsen and L. G. Scotney.
Chairman—C. D. O'Brien.

Cattle Creek Local Board—
Millowners' Representatives—P. H. McLean and C. Simonsen.
Canegrowers' Representatives—R. Allen and W. G. Merrill.
Chairman—T. E. Dwyer.

Childers Local Board—
Millowners' Representatives—C. R. Fletcher and M. B. Heath.
Canegrowers' Representatives—J. Broadhurst and J. W. Clayton.
Chairman—H. B. Carney.

Fairymead Local Board—
Millowners' Representatives—E. J. A. Crabtree and E. S. Young.
Canegrowers' Representatives—P. E. Scotney and F. J. Wheeler.
Chairman—C. D. O'Brien.

Farleigh Local Board—
Millowners' Representatives—T. G. Mulherin and J. Smith.
Canegrowers' Representatives—P. Kirwan and N. Manning.
Chairman—M. Gallagher.

Gin Gin Local Board—
Millowners' Representatives—E. N. Annand and C. M. English.
Canegrowers' Representatives—J. Laurison and G. Powell.
Chairman—C. D. O'Brien.

Goondi Local Board—
Millowners' Representatives—R. T. Challinor and D. A. Williams.
Canegrowers' Representatives—W. D. Davies and R. C. Lacaze.
Chairman—A. E. Aitken.

Hambledon Local Board—
Millowners' Representatives—K. L. Cragg and L. M. Smith.
Canegrowers' Representatives—A. W. Browne and F. C. P. Curlewis.
Chairman—A. Anderson.

Inkerman Local Board—
Millowners' Representatives—H. G. Bell and W. Gibson.
Canegrowers' Representatives—S. W. Gibson and F. J. Woods.
Chairman—G. A. Cameron.

Invicta Local Board—
Millowners' Representatives—H. B. Burstall and J. L. Mullins.
Canegrowers' Representatives—P. Hayes and H. F. Hecht.
Chairman—G. A. Cameron.

Isis Local Board—
Millowners' Representatives—A. Adie and J. Alison.
Canegrowers' Representatives—W. M. Duncan and W. G. Sherrington.
Chairman—H. B. Carney.

Kalamia Local Board—
Millowners' Representatives—R. H. Calcutt and G. G. Jerdan.
Canegrowers' Representatives—B. S. Donovan and W. H. Ferguson.
Chairman—G. A. Cameron.

Macknade Local Board—
Millowners' Representatives—A. H. Edwards and J. R. Kerr.
Canegrowers' Representatives—G. Cantamessa and T. J. McMillan.
Chairman—J. A. Murray.

Marian Local Board—
Millowners' Representatives—A. J. Coyne and J. O'Neill.
Canegrowers' Representatives—J. Binstead and E. C. Walz.
Chairman—M. Gallagher.

Maryborough Local Board—
Millowners' Representatives—T. E. Braddock and O. C. Kinne.
Canegrowers' Representatives—F. F. Bertram and H. Doss.
Chairman—J. M. Bracewell.

Millaquin Local Board—
Millowners' Representatives—G. S. Moore and E. P. Wyllie.
Canegrowers' Representatives—T. Scotney and G. F. Tesch.
Chairman—C. D. O'Brien.

Moreton Local Board—
Millowners' Representatives—G. Greathead and W. M. Whalley.
Canegrowers' Representatives—W. Kittle and A. E. Williams.
Chairman—S. L. Stormonth.

Mossman Local Board—
Millowners' Representatives—W. H. Crawford and C. H. O'Brien.
Canegrowers' Representatives—R. D. Rex and H. B. Schnitzerling.
Chairman—T. Keleher.

Mount Bauple Local Board—
Millowners' Representatives—T. Beattie and J. C. Flanagan.
Canegrowers' Representatives—R. A. Maike and P. B. Scougall.
Chairman—J. M. Bracewell.

Mourilyan Local Board—
Millowners' Representatives—L. J. Duffy and R. Sloan.
Canegrowers' Representatives—E. R. Campbell and J. F. McCutcheon.
Chairman—A. E. Aitken.

North Eton Local Board—
Millowners' Representatives—G. Johnson and S. H. Scougall.
Canegrowers' Representatives—G. N. Laws and C. H. C. Ross.
Chairman—T. E. Dwyer.

Pioneer Local Board—
Millowners' Representatives—B. C. J. Martin and C. S. Wynter.
Canegrowers' Representatives—B. S. Donovan and W. C. Smith.
Chairman—G. A. Cameron.

Plane Creek Local Board—
Millowners' Representatives—D. Greetham and J. C. Nicholson.
Canegrowers' Representatives—C. W. Davidson and P. McCowan.
Chairman—M. Gallagher.

Pleystowe Local Board—
Millowners' Representatives—R. Clarke and J. W. Inverarity.
Canegrowers' Representatives—M. W. R. Bowman and C. McKinley.
Chairman—M. Gallagher.

Proserpine Local Board—
Millowners' Representatives—C. C. Dodd and M. R. Gibson.
Canegrowers' Representatives—H. L. Hall and T. G. Mann.
Chairman—C. A. K. Morrison.

Qunaba Local Board—
Millowners' Representatives—G. S. Moore and W. A. Shield.
Canegrowers' Representatives—A. J. Christensen and C. F. Mittelheuser.
Chairman—C. D. O'Brien.

Racecourse Local Board—
Millowners' Representatives—J. M. Gibson and A. S. Hamilton.
Canegrowers' Representatives—A. Turner and T. J. H. Whitcomb.
Chairman—T. E. Dwyer.

South Johnstone Local Board—
Millowners' Representatives—F. Gillan and F. H. Gilmore.
Canegrowers' Representatives—R. G. O. Jones and D. V. Woods.
Chairman—A. E. Aitken.

Tully Local Board—
Millowners' Representatives—G. R. Blair and J. J. Cran.
Canegrowers' Representatives—H. Henry and H. N. Lund.
Chairman—A. E. Aitken.

Victoria Local Board—
Millowners' Representatives—N. R. Dowling and J. R. Kerr.
Canegrowers' Representatives—H. E. Hollins and G. G. Venables.
Chairman—J. A. Murray.

SOME COMMON VEGETABLE PESTS.*

By ROBERT VEITCH, B.Sc., F.E.S., Chief Entomologist.

The Cabbage Aphis.

The so-called cabbage aphis (*Brevicoryne brassicæ* L.) on occasions becomes quite abundant in Queensland cabbage crops, and when it does so it is by no means an easy pest to control. In addition to attacking cabbages it may also commonly be found on cauliflowers, turnips, brussels sprouts, radishes, and kohl-rabies.

Once it has become established in a cabbage crop it is capable of very rapid multiplication if conditions are favourable, and eventually large colonies of this greyish-blue insect can be seen on both the upper and lower surfaces of the leaves of infested plants. Like all aphids this pest lives by sucking the sap of its host plant, and if it is present in large numbers the plants will become seriously stunted and produce obviously sickly, yellowish-looking leaves. In severe infestations, some of the more heavily attacked plants may actually die off.

So far as is known, the life history of this pest has not yet been worked out in detail in Queensland, but some considerable amount of attention has been devoted to it elsewhere, particularly in North America. These investigations have shown that its life history is somewhat complicated, but the details thereof need not be discussed in these notes. Both winged and wingless females occur. The insect is a somewhat pear-shaped, soft-bodied, slow-moving individual, the body being covered with a white waxy bloom.

Control Measures.

With respect to control, this is generally attempted by the use of either nicotine sulphate or kerosene emulsion sprays, preference now being given to the former insecticide. When the aphids are actually wet with the spray the result is quite satisfactory, but in practice difficulties exist in its application. The body of the aphis, as already mentioned, is covered with a fine film of wax which renders effective wetting of the insect a matter of some considerable difficulty. Furthermore, the aphids are so protected in their colonies on the leaves that it is frequently difficult to reach all of them with the spray.

Nevertheless, in spite of these adverse factors, spraying with nicotine sulphate, "Black-leaf 40," reduces infestation appreciably, thus allowing the young plants to continue growing. The formula that is generally recommended is ¾ pint of "Black-leaf 40" in 100 gallons of water to which 4 or 5 lb. of soap is added. Kerosene emulsion may be used if nicotine sulphate is not readily available. The preparation of this emulsion has already been dealt with in the chapter devoted to the discussion of insecticides.

Natural enemies play some part in checking this pest in Queensland, and not infrequently the aphis is heavily attacked by small wasp parasites. In spite of the presence of these beneficial insects, however, the aphis, as has been said, quite frequently gets out of hand. In such a

* Reprinted from "Pests and Diseases of Queensland Fruits and Vegetables," by Robert Veitch, B.Sc., F.E.S., and J. H. Simmonds, M.Sc. Published by the Department of Agriculture and Stock, Brisbane.

case spraying must be adopted, and in doing so it is highly desirable to commence operations as soon as there are signs of the aphis becoming unduly abundant.

The Diamond-back Moth.

The diamond-back moth (*Plutella cruciferarum* Zell.) is probably the most serious pest of cabbages in Australia. It is one of a large number of undesirable insect introductions from Europe, where it is well known as a pest not only of cabbages but also of turnips and other crops. It attacks cabbages, cauliflowers, turnips, brussels sprouts, radishes, and horse radishes, as well as some other crops of importance, and it has also been recorded from several garden flowers and from a number of weeds. It has gradually become distributed throughout the world, both in the tropic and the temperate zones. In Queensland it is considered primarily a pest of cabbages.

The very minute eggs are laid on the leaves of the cabbages, and the larvæ or caterpillars hatch out after a brief incubation period. These larvæ feed on the foliage, and eventually the attacked leaves become riddled with holes at the spots where feeding has taken place. The larvæ grow fairly rapidly, and after passing through a series of moults they attain full size when they are slightly less than ½ inch in length. They are green in colour, and are rather slender, active, spindle-shaped caterpillars clad with only a few short bristles. The full-grown larvæ cease feeding, and then pupate on the leaves in very beautiful, silken, lace-like cocoons the strands of which are so loosely woven together that the pupæ can be distinctly seen within. The moths emerge from the pupæ after the usual transformation processes have taken place.

The moth is rather a pretty little greyish-brown species with a wing-spread of about ⅔ inch, the name "diamond-back" having been conferred upon it as a consequence of the appearance the male moth presents when at rest with the wings folded. The pattern of the front wings is such that when they meet on being folded there appears a chain of three diamond-shaped marks. The wing pattern is less definite in the female moth and the same chain effect is not produced. The moth when at rest tilts its wings in a very characteristic fashion.

CONTROL MEASURES.

Spraying is largely adopted for the control of the diamond-back moth, and a certain measure of success attends this procedure, although it cannot be claimed to be thoroughly effective. Arsenate of lead sprays are used against this pest, but, on account of the possible danger to the consumer, cabbages should not be sprayed with this poison after they have commenced to heart.

Kerosene emulsion has been recommended by some investigators as useful for keeping down infestation in young plants, and nicotine sulphate has been recorded as being similarly successful. Watering the cabbages with very hot water is also said to be a useful procedure, but for obvious reasons it can be adopted only on a relatively small scale. It is claimed that the water can be applied sufficiently hot to kill the caterpillars without appreciably injuring the fleshy foliage. When cabbages are grown commercially it would generally, however, be necessary to employ one of the three insecticides just mentioned, namely, arsenate of lead, nicotine sulphate, or kerosene emulsion. To achieve success, spraying must be repeated several times and must be commenced early in the life of the crop.

Stricter attention to farm hygiene than is sometimes given by cabbage-growers will also be productive of beneficial results. All too often the grower cuts the marketable cabbages, and leaves the useless ones to rot on the ground and to act as breeding grounds for myriads of cabbage moths, which naturally immediately infest any new area he may plant up in the vicinity. Where it is practicable to do so, this source of danger should be eliminated.

The cabbage-grower attempting control along the lines indicated in the preceding paragraphs will obtain some measure of relief, but it must be admitted that the control of this pest is as yet on a somewhat unsatisfactory basis.

The Pumpkin Beetle.

The pumpkin beetle (*Aulacophora olivieri* Guérin) is an important pest of cucurbitaceous plants, and it may very frequently be found in large numbers on the vines, feeding on both the foliage and flowers. It is quite the most serious Queensland insect enemy of pumpkins and allied plants.

It commonly attacks pumpkins, water-melons, rock-melons, cucumbers, and vegetable marrows. On one occasion it was also recorded in New South Wales as a pest of ripening cherries, but such an attack appears to be of a somewhat abnormal nature, and for present purposes it may be regarded exclusively as a pest of cucurbitaceous plants such as those mentioned.

The beetle, which is responsible for the destruction of the flowers and foliage, is a very conspicuous insect measuring about $\frac{1}{4}$ inch in length, the length being about twice as great as the width. It is orange-yellow in colour with two very distinct large black blotches on each wing-cover. This species is frequently referred to as a ladybird, but it is quite distinct from the ladybird beetles, which are different in outline, being decidedly rounded whereas the pumpkin beetle is definitely elongate in shape. In the leaf-eating ladybird, damage to the foliage is inflicted by both the beetles and their larvæ, but, in the case of the pumpkin beetle, foliage and flower losses are caused by the beetles alone, for their larvæ have been recorded as possessing root-frequenting habits.

CONTROL MEASURES.

With respect to the control of this pest, a certain measure of success may be obtained by spraying or dusting the attacked plants with arsenate of lead. As an alternative to spraying or dusting, the beetles, where numerous, may be collected by shaking them into shallow containers in which a mixture of kerosene and water has been placed. This operation is most successfully performed when the beetles are sluggish and do not readily take to flight on the infested plants being jarred; it should therefore be carried out in the early morning. It is particularly important to destroy any beetles that show up early in the season, and the expenditure of energy involved in the operation will generally be amply repaid if the young plants are periodically carefully examined, and the beetles found associated with them destroyed.

Young plants may be protected from attack if the seedlings are covered with some form of netting which has been stretched over a suitable framework to prevent the beetles gaining access to the seedlings. Such a protective measure, however, is practicable only on a small scale.

It will, nevertheless, tide the seedlings over a very dangerous period when the attack of a few beetles may very seriously injure or even kill the infested plant.

A further control measure that has been suggested by some investigators is to liberally dust the plants with wood ashes or lime, or alternatively with road dust. This procedure is said to act as a satisfactory repellent in outbreaks of ordinary severity.

The Bean Fly.

As a result of the presence of the bean fly (*Agromyza phaseoli* Coq.), the growing of beans in coastal Queensland is often rendered quite unprofitable during the warmer months of the year. Bean plants which may be growing under ideal conditions of soil and climate are all too frequently noticed to be in a far from flourishing condition. The plants may be wilted and stunted, and they may eventually fall over or break off and die.

The unhealthy condition of these plants is in all probability due to the presence of bean-fly infestation, and such a suspicion can be confirmed quite readily by an examination of the stalk of an affected plant. In typically infested plants the stalks will be found to be abnormally swollen in many places, and furthermore they will be seen to be frequently split open where the swellings occur. An examination within the tissue of these swollen fissured areas will usually speedily disclose the presence of the creamy-coloured maggots responsible for the damage. These feed within the tissue of the stalks and produce the effects just described. When full-grown the maggots pupate in the stalks, the pupæ being enclosed within small yellowish-brown puparia. At the end of the pupal period the very insignificant black flies emerge.

CONTROL MEASURES.

It has been found in practice that the control of this pest is a matter of very considerable difficulty. The use of sprays does not offer any appreciable prospect of success, but eventually a repellent may be found that will justify application with the object of preventing the female fly from laying her eggs on the bean plants. In the meantime, however, the grower of beans must fight this pest by strict attention to market garden hygiene.

The bean-fly population may be appreciably reduced by the prompt destruction of useless infested plants. These should be pulled up and burned, instead of being allowed to remain in the ground to breed out further batches of flies from the maggots and pupæ which they are harbouring. The time devoted to the application of this quite simple control measure will generally be time well spent.

It has also been found that some measure of relief may be obtained by hilling up the plants so that they may have a chance of producing adventitious roots above the injured portions at the base of the stem.

The Onion Thrips.

The only insect pest of onions that commonly comes under the notice of the entomologist in this State is the onion thrips (*Thrips tabaci* Lindeman). This destructive little insect is a relative of the species that is responsible for "rust" in bananas.

The onion thrips is a very delicate yellow or yellowish-brown insect possessing two pairs of characteristically fringed wings and measuring about $\frac{1}{25}$ inch in length. It is practically cosmopolitan, and is a pest of a very wide range of economic plants, although for present purposes it will be considered solely as an enemy of onions.

The adult and nymphal or immature thrips both attack the leaves of the onion plant. They lacerate the surface of the foliage and feed on the plant sap where the surface has been injured. At each point of attack a small white blotch develops, and the whole plant may eventually be covered with these silvery or white blotches. The leaves wilt and fall over, and a reduction in the yield of the crop must obviously be expected when the thrips infestation is severe. The condition produced as a result of the feeding of this pest is often referred to as "white blast."

CONTROL MEASURES.

When the onion crop is infested by this thrips, spraying with nicotine sulphate should be practised. This procedure is generally productive of good results in the case of young crops, but in the older crops satisfactory application of the spray is more difficult, and results are not so good. Spraying with nicotine sulphate is, nevertheless, quite worth while even in the case of older plants. Several applications of the spray are usually necessary in order to produce the desired results.

SOME OBSERVATIONS ON THE *ONCHERCERCUS GIBSONI* IN ITS UNINCAPSULATED FORM IN QUEENSLAND CATTLE.

By J. A. RHEUBEN, Inspector of Stock, Brisbane.

Following on experiments conducted in 1920 at the Stock Experiment Station, Townsville, by Mr. A. McGown, M.R.C.V.S., and the writer, and reported in the Annual Report of the Department of Agriculture and Stock for that year, and observations made from time to time by Dr. R. W. Cilento and the writer, and reported in an article headed "The Possibilities of the Transmission of *Onchercercus Gibsoni*" published in the "Medical Journal of Australia," Vol. 1, No. 16, and the publication by Dr. Heyden of his article, "Observations of the Larvæ of the *Onchercercus Gibsoni*," published on the 3rd March, 1927, the writer was led to inquire into the cause of the presence of these larvæ.

As a result of these investigations I am now able to record that 90 per cent. of the cattle slaughtered for human consumption in the Brisbane metropolitan area are heavily infected with the unincapsulated *Onchercercus Gibsoni* in colonies of males, females, and larvæ.

On 19th February, 1929, Inspector Herbert Hunter of the Stock Department and the writer carried out investigations on twenty-nine head of cattle slaughtered at a private abattoirs at Salisbury, and of these carcasses twenty-eight were infected.

On the 4th April of this year Dr. J. Legg, Mr. G. E. Rogers, and the writer inspected fifty-three carcasses of oxen, all of which proved to be infected.

The principal sites of infection in the forequarters proved to be in the Ligamentum Nuchae and the connective tissue between the trapesius, the illeo, spinalis, and the ceratus magnus muscles.

In the hindquarters, in the connective tissue of the popliteal space the quadraceps femoris, the vastus externis, and the gastronemius muscles and also in the pocket formed by the ligament semi-membranosis at its insertion. On several occasions I have removed from these localities both sexes, the female up to 11 feet in length and males up to 1 foot.

The reason for this article is to show that one of the main seats of infestation by this parasite has not been thus far observed by previous investigations.

My thanks are due to Major A. H. Cory, Chief Inspector of Stock, for his sympathetic assistance given me during my investigations.

At a later date I propose to publish the result of my eleven years' investigations into the life history of this parasite.

SHEEP MAGGOT FLIES.

The Minister for Agriculture and Stock (Mr. Harry F. Walker) has furnished the following memorandum on Sheep Maggot Flies, submitted to him by Mr. J. Carew, Senior Instructor in Sheep and Wool.

MOISTURE on sheep is an attraction to blowflies, and it is also necessary in their development from the larvæ stage to the adult fly. In the event of a sheep dying, blowflies are likely to deposit their eggs or larvæ within a few hours. For the first week or so the carcass usually gives off a considerable amount of moisture, and as the feeding period of the larvæ only lasts from four to six days they can find sufficient moisture about the carcass to pupate, from which they emerge within two weeks. Dry and cold conditions deter their development. The first step to take to control flies is the attention to dead animals or carrion of any description, which may either be destroyed or converted into a trap of destruction by sprinkling arsenic or powder poison dip over, under, and about the medium of infestation.

In accordance with previous observations, their actual numbers did not indicate the intensity of attack, but rather that they worked up to intensive attack by waves.

Each species predominates in the adult stage at definite seasons peculiar to itself, and some of these species indicate that they cause more serious effects than others even when smaller numbers are present.

Since the experiments at Dalmally were discontinued in 1923 very little, if any, progress towards either control or prevention has been made. From about 1925 until last year the blowfly attack has been very light, no doubt owing to the drier conditions, but in some districts, chiefly during the spring of last year, they became very troublesome.

Health of Sheep a Prime Factor in Resistance of Attack.

These years of quiescence left the sheepowners rather careless regarding the protection of their flocks, as the numbers struck did not usually exceed the odd ones that were treated by hand dressing. With the advent of a fair summer rainfall and the gradual increase of the fly, no opportunity should be lost in getting the sheep in such a state as best to resist an attack. This resistance may be assisted in many ways, but the first thing to be considered is the health of the sheep.

Parasites, either internal or external, render the sheep more prone to fly attack. Internal parasites, especially stomach and intestinal worms, are the worst offenders, for when they become troublesome they cause derangement of the digestive organs, resulting in mild to severe scouring according to the severity of attack. This scouring will develop whether the sheep are on a scanty pasture or not, with the result that if flies are present the scouring sheep affords a suitable striking medium.

If the feed is green and plentiful the excreta of the sheep is likely to become soft and adhere to the wool. If a few flies are about after the first rain an increase can be expected, but, by the time they become numerous, if the dags are dry no serious attack can be expected, but should a shower of rain fall and these dags become damp a serious attack may occur. Should the sheep be crutched, shorn, dipped, or jetted beforehand, much trouble is saved and probably no complete estimate of the advantage derived from the operation, whichever it may be, is made. Should the sheep be in half wool or longer when the attack occurs, the quickest way of giving protection is the most satisfactory, for once a sheep is struck other flies are attracted, probably resulting in a severe infestation in a few days. Other sheep in the flock may be struck, but any mustering where clean sheep are brought into contact with those that are blown only encourages further trouble unless the flies are destroyed or the sheep protected.

Jetting or Dipping.

Jetting or dipping suggest themselves, for either of these methods, if properly done, will kill the maggots on the sheep as well as poison many of the flies that are attracted by the moisture in the wool. The two chief points to be considered are to see that the poisoned liquid penetrates to the skin and that it is of the desired strength.

Jetting is performed by forcing the prepared liquid through a nozzle into the crutch of the sheep. The area that should be jetted as a safeguard against the attack of the fly should be over a space extending from above the tail and carried down at each side of it to the crutch, which should take in all the stained portion.

Length of wool or the presence of dags does not matter, provided the mixture is forced to the skin. The long wool will hold more poison, thus giving a greater amount of protection. Sheep that are struck should be jetted without being crutched. When the sheep are returned to their pasture, if time permits those showing distress may be given any further treatment that may be necessary. If the wool is removed, the usual force of jet would be too severe and cause injury, if not death. A hospital paddock should be set aside for all affected sheep; this for two reasons—firstly, to save travelling and hold them in a convenient paddock; and, secondly, once a sheep is struck it is more subject to further attack and is best kept out of the healthy flock.

The Committee of Investigation under the Council for Scientific and Industrial Research, who conducted the experiments at Dalmally, concluded that jetting with

PLATE 72.—A CASE FOR TREATMENT.

a solution consisting of 7 lb. arsenic with an equal quantity of carbonate of soda to 100 gallons of water gave 90 per cent. protection for three months.

The weather at and after jetting is an important factor, but it is regarded that the quantity of arsenic in the wool of the breach is the ingredient giving protection. Many dip mixtures are on the market, those containing arsenic being the most effective in protecting sheep.

The pressure necessary varies according to the length of wool from 160 lb. per square inch for sheep carrying eight months' wool to 60 lb. per square inch for crutched or shorn sheep. Jetting in an ordinary race is not so satisfactory as where the sheep are in a raised race. The upward tendency when applying the jet is a

PLATE 73.—JETTING RACE, BARATRIA STATION.
Note hand raised to pull cord in closing swing gate. Total length of race 50 ft., width 16 in., height to 3 ft. 6 in.

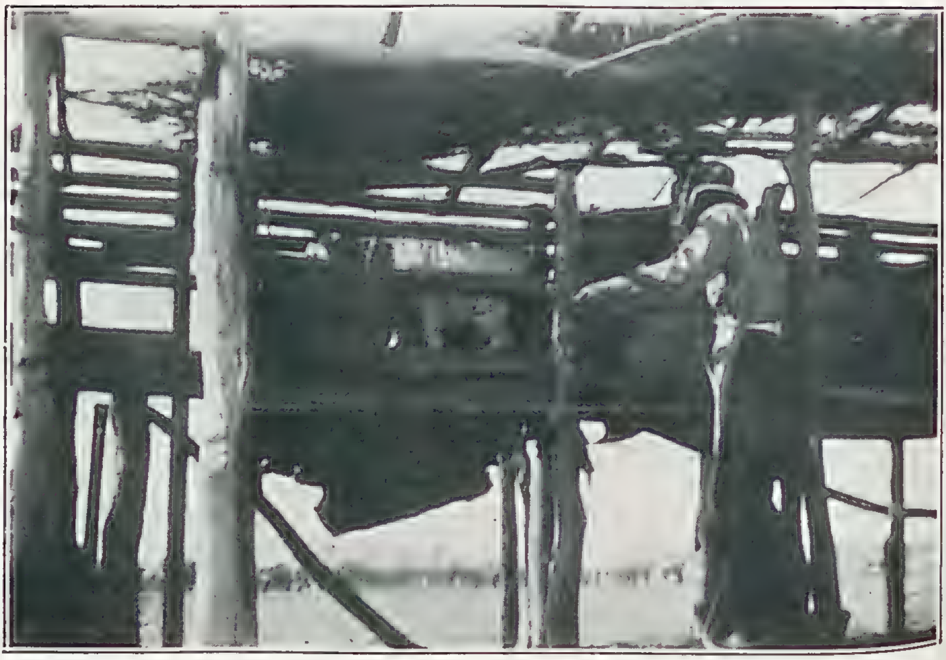

PLATE 74.—JETTING SHEEP AT BARATRIA STATION, 1929.
Note hand on lever to open sliding gate.

decided advantage, besides which the surplus mixture which falls from the wool may be recovered. This, on analysis, loses very little strength. Where small numbers are to be treated a hand-pressure pump will be sufficient, but in dealing with large numbers a power plant is more suitable.

When investigating the blowfly trouble in the Central-West last season the weight of evidence was in favour of jetting.

The Operation in Practice.—A Serviceable Plant.

Mr. Barton, Baratria Station, states that provided the jetting mixture is correct and properly applied, he has every confidence in its being the best means in protecting large flocks of sheep. On Baratria Station there are three elevated races which are the cheapest, simplest, and most economically worked that I have seen in use, and quite as efficient as any other style for thorough application. It is 50 feet in length and 3 feet 6 inches above ground level at the highest point just ahead of where the sheep is jetted. It is fitted with two sliding and one swing gate. This swing gate forms part of the side of the race. When the sheep passes this swinging gate the sliding gate is pushed across the race to hold it while being jetted. When the sheep is jetted the jet operator opens the sliding gate with his left hand by means of a long lever and at the same time opens the swing gate. The jetted sheep, seeing the opening in the race and also the jetted sheep in the yard, moves away and is followed by the next sheep, the sliding gate being pushed back to keep it in position while the swing gate is drawn back across the race by means of a rope by the man whose duty it is to keep the sheep up to the operator. This swing gate holds the next sheep back, and at the same time gives the opening in the side of the race to the operator to work the nozzle, which should be a straight jet.

The race is 16 inches wide inside measurement and is floored with battens 3 inches by 1½ inches spaced ¾ of an inch apart. The uprights in use were 3 by 2 inches hardwood, as were also the sleepers to carry the cross pieces in the race. The race is 14 feet in length, starting at the forcing yard at 6 feet, narrowing down to the race 16 inches wide. Bush timber for uprights would be suitable, as also for sleepers to carry the cross pieces in the race. These latter, as well as the cross pieces in the ramp, could also be split bush timber. While present, Mr. Barton jetted 100 sheep in twenty-five minutes, having four men keeping the sheep up to him.

If jetted sheep are blown the poison in the wool controls the growth and spread of the maggot.

Dipping.

This is another means by which both maggots and flies may be controlled and the sheep protected for several weeks.

The strength of the mixture should be at the rate of 2 lb. arsenic to 2 lb. carbonate of soda per 100 gallons of water when the wool is up to four months' growth. When the wool is longer the strength can be reduced to 1½ lb. at nine months' growth, but the longer the sheep must stay immersed.

Sheep should not be dipped immediately after shearing, but allowed about two weeks for the skin to recover and the cuts to heal. The sheep should not be thirsty or over-heated at the time of dipping. See that they are well drained before being put on the pasture, as the drips falling on the grass may be eaten by those following, which, if in sufficient quantity, would poison them. Fine weather should be selected and all sheep dipped as early as possible in order that they may become fairly dry before night.

Crutching also is an advantage, and to a great extent assists in protecting the sheep, as 90 per cent. are likely to be struck about the crutch. In picking out and crutching the sheep already struck, more harm than good is likely to be done, as mustering clean sheep and bringing them in contact with those that are blown usually causes a further spread of the trouble.

In crutching there is no attempt to deal with the fly, and it often happens that a few weeks after crutching 20 per cent. of the flock will be suffering from a fresh attack. As the maggots develop they do not find sufficient covering in the crutched part, with the result that they spread to the long wool. Their presence in the body wool soon induces flies to move to that part, where further trouble is generated.

If crutching is practised midway between shearings good must result, especially where ewes are treated, as by the time shearing comes on there is a sufficient length of wool to be properly shorn, but if the wool is short it is often missed, with the result that many sheep are turned out prone to a fresh attack at no distant date.

THE FAT LAMB INDUSTRY IN QUEENSLAND.

By J. L. HODGE, Instructor in Sheep and Wool.

THIS is a branch of the sheep industry which has been greatly neglected by the farmers of the State. The opening for very excellent profits is there, not only for farmers, but also for those graziers and pastoralists whose properties happen to be near the railway, or who are so situated that they can handle fat lambs by other means of transport, such as motor transit. The day has arrived when it is not a question if the farmer can run a few sheep, but rather whether he can afford to be without them.

Profitable Returns.

At the present time prices are depressed, but this is a condition in the industry which we have seen before with an ultimate recovery. Up to twelve months ago the prices realised in Brisbane fat stock markets have been most encouraging to the fat lamb grower, prices ranging from 7d. per lb. up as high as 9d. per lb., plus skin values, working out at an average of round about £1 per head.

On these figures the returns should be very profitable to the grower, but even at present prices they should be adequate.

Suitable Fodder Crops.

It is recommended that farmers growing fat lambs for market have some fodder crop. This should be ready when the ewes have lambed. They can then be put on with safety. Wheat, barley, oats, and panicum are all first class for the purpose, and in some cases when the flock is not too large the farmer may harvest a crop.

Attention to the Health of the Flock.

The utmost care should be taken of the health of the breeding flock.

Careful observation will detect the presence of the attacks of the blowfly. Immediate treatment is necessary to maintain the condition of the affected ewe. A letter to the Department of Agriculture and Stock will receive prompt attention and give the necessary treatment in this and other matters.

An early infestation of worms should be early detected, and the drenches recommended by the Department used.

Watch should be maintained, especially in our North Coast lands, for the attacks of scrub ticks. In fact, every care and attention should be given the flock, to which they so readily respond.

A sheep lick to suit the particular conditions of the country and flock may be advisable. In this case it is advisable to get in touch with the Department, so that a lick suitable may be prescribed.

The scientific use of a lick is to supply any proved deficiencies in soil, fodder, or water.

Care should be exercised when feeding sheep on growing lucerne. Hoven is the danger. Accustom the flock to the feed gradually, and in no case allow the flock in the cultivation during wet weather; this for two reasons—safety of the sheep firstly, and preservation of the paddock as a secondary consideration. Keep the flock away from the lucerne until well after sunrise on winter mornings. The lucerne paddock should be securely fenced to ensure the farmer being certain his intentions are carried out.

Foundation Stock.

As a basis of operations, and for the purposes of this article, I would advocate the use of a big, bulky, strong-woolled merino ewe, four to six years old. Younger ewes are not recommended on account of the possible loss in lambing. When discussing the ram to be mated with these ewes, the class of country, rainfall, and other matters must be taken into consideration. In all cases early maturity in the lamb is the object which should be constantly before the farmer.

Where some artificial feed is available, such as lucerne, a lamb should be fit for the market at from four to five months of age.

The utmost care should be taken at marking time to see that the operation is scientifically and cleanly done. The ideal time for marking, where fat lambs are in question, is from a fortnight to three weeks after birth. This gives the lambs every chance to recover and make good the loss entailed in the operation before marketing time.

Utility Sheep.

The Border Leicester-Merino ewe cross lamb is very attractive, being in every way suitable for the trade.

The Corriedale is by many Merino men regarded with some doubt on the ground of his purity. I am not one of those, maintaining that the breed may be regarded as fixed and thus able to reproduce his type. Personally, I regard the Corriedale as a very fine farmer's general utility sheep. He grows a very useful fleece of about 56 count, and crosses with the Merino splendidly.

I think it may be well here to explain what is meant by wool men when talking of a "count" with regard to wool. The simplest way to put it is to say that a "count" in the trade equals a hank. A hank is 560 yards long. A count of, say, 60 multiplied by 560 represents the length of single fibre of wool which can be spun from 1 lb., thus:—

1 lb. wool 60 count.

60 x 560 = 33,600 yards.

The Lincoln sire crossed with the big-framed Merino ewe produces a fine early maturing lamb of great size and weight. The wool cross, too, is not a bad one.

For districts where the rainfall is fairly sure and over 40 inches, especially if the country is low-lying, I am a strong advocate for the Romney Marsh-Merino cross. This sheep in swampy country will literally live and do well where others may be a total failure. The Romney grows a nice bright fleece with more character than the Lincoln, and from a wool point of view crosses splendidly with the Merino. However, the fact should never be lost sight of that in the matter of fat lambs the wool is a secondary consideration.

A cross very popular in parts of South Australia and Victoria is the Shropshire-Merino cross. The resulting lamb from this cross is exceptionally well shaped, and as they say in the trade "the leg sits well on a dish and does not hang over." The wool from the Shrop-Merino cross, however, is not to be highly recommended, being coarse and generally of low value.

Many breeders in the Southern States advocate the use of crossbred ewes mated with a purebred ram, say, Lincoln Merino cross ewe-Lincoln ram, thus giving a three-quarter bred Lincoln lamb. This plan certainly gives a very early maturing lamb, but the difficulty in Queensland is to obtain the good direct cross ewes.

On the whole, taking all things into consideration, and with the material at hand, I would advise the Queensland farmer to start off with the big, roomy, strong-woolled Merino ewe. From this start the farmer may, should he so desire, keep back his ewe lambs for future use in his business. This plan, however, entails weary waiting and the use of more country than the farmer can usually afford.

The better plan, I think, is for the farmer to start off with the Merino ewes indicated, and, when satisfied that they have served their purpose and are becoming unprofitable, to put them on the cultivation, fatten, and sell, buying more ewes of the type required to carry on the business.

Local Conditions.

To return to the sire to be mated with the ewes, many offer, and all have their points. The choice, therefore, should be greatly governed by the class of country and the rainfall generally recorded. For the Darling Downs I recommend the Border Leicester, or the Lincoln, or a Downs breed. All throw early maturing lambs.

Marketing.

It is absolutely essential, if top prices are to be obtained, that the lambs should arrive at the market or at the freezing works with the bloom on them. To achieve this object a very good plan—and one not generally practised in Queensland—is to drive the ewes with the lambs to the trucking yards and do the drafting there. The lambs then arrive at their destination right off the teat, and no great hardship is inflicted on the ewes.

Prospects of the Industry.

With the opening of the Dawson Valley country a good opportunity should present itself to the occupiers of those lands if they are carefully guided and advised in the matter of fat lamb raising, either for the local market or the overseas trade.

A good opportunity also exists for the farmers on the Atherton Tableland, both in the matter of fat lambs and wethers. In many cases it is a common occurrence for fat sheep to come in from the West to the Brisbane market and to be retrucked far away up North to satisfy the desire for mutton.

WEEDS OF QUEENSLAND.

BINDWEED (*Convolvulus arvensis*).

By C. T. WHITE, Government Botanist.

Description.—A slender twiner with long, creeping, white, underground stems any part of which broken off may form a new plant. Leaves alternate on slender stalks of about half an inch, the leaf itself (blade) halbert-shaped with backward pointing lobes at the base or a few of the lower ones more elliptic in outline and without any basal lobes, mostly about an inch long. Flowers white or pink (white on the only Queensland ones seen), bell or broadly funnel shaped, half to an inch across, borne either single or in pairs on a slender stalk (peduncle) in the leaf-axils, the peduncle bearing a couple of minute bracts about two-thirds of the way up. Capsules globular, 2-celled and mostly 4-seeded; seeds dark brown or dull black, irregularly pear-shaped with one side more or less flat, the other rounded, about ⅛ inch long, the surface roughened with minute but prominent asperities.

Distribution.—A native of Europe now naturalised as a weed in most temperate countries (North America, Australia, New Zealand, &c.). In Queensland so far confined to the Darling Downs.

Common Names.—Bindweed or Field Bindweed are the commonest English names. Bell Bind, Cow Bind, and small-flowered Convolvulus or Morning Glory are other names sometimes given it. In Queensland the term Bell Vine or Bell Bind is generally applied to an allied plant—*Ipomaea plebeia,* somewhat of a pest in a few places, especially in the Lockyer district.

Botanical Name.—Convolvulus from the Latin *convolvo* (*volvi, volutum*) to roll round or entwine; *arvensis* from the Latin *arvum* a ploughed or sown field, in botany mostly used as a specific name of weeds of arable land.

Properties.—Not known to be poisonous or harmful in any way, nor on the other hand to have any economic value.

Eradication.—The Bindweed is one of the worst weed pests so far introduced on to the Downs, and farmers should eradicate it as far as possible on its first appearance. At present it seems to be confined to a few isolated patches but will undoubtedly increase once it gets a fair hold. It produces a large number of underground-running roots. Any part of these roots which is cut by a fork or plough forms a new plant. If the patch is only a small one it is probably better not to disturb the ground but to cut the young shoots and green portion down as they appear. If this is done regularly for a time the underground parts should become exhausted. A weak arsenical solution poured into the patch could be tried, and with this type of plant it may be mentioned that it is generally better to use a large amount of rather weak solution than a small amount of strong. If it is decided to fork the plant out, care should be taken that the underground roots are not carried about the farm and dropped here and there. The weed is a very bad one in Canada and parts of the United States, and the United States Department of Agriculture has issued a cyclostyled circular dealing with its eradication. This says: "The character which makes bindweed so pernicious is the possession of deep-running underground parts from which new plants arise. Even a small piece of the underground growth may develop into a new plant. Care should always be exercised to avoid scattering pieces of bindweed by means of ploughs, cultivators, &c."

Any method for the eradication of bindweed must aim to destroy the underground growth, either by direct removal, which is usually impracticable, by chemical means, or by starvation by means of constantly removing the aboveground green growth. The best methods are:—

(1) *Salting.*—The important feature in controlling bindweed is to eradicate the small patches which first appear in the field. Unless such patches are eradicated, the plant will eventually spread over the entire farm, oftentimes rendering the land valueless. The best method of eradicating patches of bindweed is to apply dry salt at the rate of from ½ to 1 lb. of salt per square foot. If any bindweed plants survive, they should be treated to a second application of salt. The salt kills the bindweed, and makes the soil unproductive for several seasons thereafter, but barren spots in the field are far more desirable than centres of bindweed infestation.

(2) *Cultivation.*—Plant corn or any other clean-cultivated crop in check-rows. Cultivate throughout the growing season of the weed at least every ten days, preferably using the knife or sweep type of cultivator, or, in case these are not

available, use the disc cultivator but never the toothed cultivator. It may be necessary to go over the hills with the handhoe following such cultivation. Two years of this procedure should completely starve out the weed. It is well to follow the next season with a shade crop, such as buckwheat, millet, soy beans, sorghum, alfalfa, or lucerne.

(3) *Fallowing.*—Allow the land to remain fallow for an entire season, clean-cultivating at intervals of about ten days. Two seasons may be necessary to secure complete eradication. Experimental results in western Kansas indicate that large areas of bindweed can be practically eradicated by fallowing the infected land intensively for an entire season, followed by sorghum the next season. A single crop of sorghum thus secured was as heavy as the combined crops for the same period of time on land continuously in sorghum. Sorghum alone did not eradicate the weed.

SUGGESTIONS.

Alfalfa, because of its excellent smothering effect and the frequent cutting this crop receives, is one of the best all-round means of controlling bindweed in sections where alfalfa grows well. Cowpeas, sorghum, millet, soy beans, and buckwheat are also useful as smothering crops, but are rarely as successful as alfalfa. It is well to follow alfalfa with a clean-cultivated crop, such as corn.

Pigs are fond of both the underground and aboveground growth of bindweed. If the land is ploughed it will greatly assist the pigs in removing the underground parts. Sheep pasturing has been found helpful, but is not as useful a method as hog pasturing. Grazing helps to hold bindweed in check, but cannot be depended upon to secure eradication.

The use of chemicals other than salt against bindweed has not been successful except under special conditions, and is not recommended.

Care should be exercised to prevent the introduction of the pest by means of (1) impure seed, especially impure wheat seed, (2) manure—bindweed seed may be contained in the droppings or may enter manure by the addition of bedding containing bindweed seeds—and (3) thrashing outfits—thrashing machines, unless thoroughly cleaned, may carry seeds of bindweed from farm to farm.

Botanical Reference.—Convolvulus arvensis linnaeus Species Plantarum 153. 1753.

WHEN PASTURE FAILS—A WINTER FODDER REMINDER.

No artificial food can compete in cheapness with natural grass, but to rely entirely on pasture is to fail in obtaining the principal advantages from such pastures. The planting of fodder crops to supplement the supply of food afforded by pastures is a wise precaution whatever the district.

In advancing some reasons for the practice on coastal country, an instructor of the New South Wales Department of Agriculture points out that the paspalum pastures make excellent growth during the favourable summer months, but that they do not make much growth during the autumn and winter. Every dairy farmer has experienced the rapid increase in production with the flush of young grass in the spring, and has also experienced the falling off in the autumn whilst there was still an abundance of feed. The rapid increase in the spring is due to the high protein content of the young grass, which equals many of our valuable concentrates. As the grass grows and becomes coarse the protein content becomes very low, with the result that the old grass in the autumn, though abundant, is of poor feeding value. By piecing out the failing grass with green fodder crops, stock can be assured of that amount of feed required to maintain them in a state of greatest efficiency.

Once an animal becomes reduced in flesh, let the owner attempt to bring it up again to its condition of greatest usefulness as a producer, and he will have brought home to him how great his loss has been through sparing the feed. Other things being equal, the animal that consumes the greatest amount of feed gives the best return. It is also clear that if an animal gets only sufficient food for bare subsistence, the farmer gets nothing in return for his feeding. It is the amount in excess of the vital demands of the animal that is devoted by it to the formation of the product, its yield of which is the reason for its place on the farm.

RURAL LIFE IN OTHER LANDS—XII.

By the EDITOR.*

MARKET MEMORIES.

FROM the dawn of civilisation man has always wanted to sell a surplus of the things he produced, whether by a system of exchange, barter, or bargaining. Even among primitive peoples like our own aboriginals some system of inter-tribal trade operates. For instance, long before the coming of the white man to this country there were regular trade routes from one part of the continent to another. Sandalwood, pituri, and pigments for corroboees were, among other substances or commodities, the subjects of barter or exchange.

A Village Market in France.

The scene on pig day in any of the smaller Queensland towns gives some idea of market day in some of the little villages of Europe. There one may see in operation the age-old human activity—as old as agriculture itself—of bartering and bargaining the products of soil and toil.

I remember such a scene at the little old-world French village of Fauquenberques, a quaint little hamlet hidden in the fold of the open chalk downs country back of Hazebrouck, towards the channel coast. From early morning the country people, mostly shod with wooden sabots, had been clattering along the roads to town carrying their produce to market. The older women had retained their quaint peasant costume of stiff linen poke bonnets and other frills and furbelows, and, walking with them, similarly burdened, were the younger women and girls arrayed in short frocks of modern fashion, silk stockings, high-heeled shoes, and other appurtenances of up-to-date flapperdom. The contrast in costumes was most striking, and illustrated, as nothing else could do so effectively, changing times and changing country customs in the old world. The sabots worn by the older women, and the last thing in footwear by their daughters, together with the marked differences in headgear, illustrated the old and the new, the emancipation of the peasant woman, and, if you like, the revolt of modern youth.

The market square in the village soon became a scene of bustling activity. Stalls and booths were erected, and through the whole of the morning the huckstering and the bargaining, the buying and selling went on. The cattle of course were not yarded as at a Queensland sale, but were tethered to any handy post. Around the pig and other small live stock pens most of the men congregated. They were all dressed for the day in their Sunday best, but in their judgment of values, their keen scrutiny of the lots offering, their sage remarks and humorous asides and arguments with the salesman, they were very much like a crowd of farmers the world over. At times one could almost persuade himself that he was back home at a Queensland pig sale. It only wanted a few of the crowd to appear in beaver moles and "Jacky Howe" shirts to complete the parallel; the illusion was only momentary, however, for one could hardly associate rusty black swallow-tail coats and "boxer" hats with a pig sale in, say, Nanango.

A Dutch Cheese Market.

A Dutch cheese market was altogether different, the local customs and conditions, of course, having no points of resemblance. I am speaking of the regular cheese market at Alkmaar, a town in Holland of about 20,000 people, and within about an hour's run by rail from Amsterdam. From the guide book one learnt that its successful resistance to besieging Spaniards, something like three and a-half centuries ago, was one of many heroic episodes in the long fight for national independence. The long twilights there, by the way, as in other parts of Northern Europe were astonishing to an Australian. There one could read a newspaper easily by daylight at ten o'clock. Up in the far north of Scotland one had the same almost uncanny experience of reading by daylight at an hour when home in Queensland one would usually be well into the land of dreams.

At Alkmaar the cheese is delivered by canal on clumsy-looking barges. Looking down into the hold of any of these water wagons one saw shelves piled high with yellow balls of cheese. The method of discharging the cargo was interesting. A man in the boat tossed two cheeses at a time to a mate on shore, who caught them with the ease and grace of Tommy Gorman accepting a pass from the base of a scrum. The cheese balls evidently stand a good deal of knocking about. On the

* In a Radio Talk through 4QG.

canal side they were laid two deep in long, broad rows and covered with a cloth. Cheese was also brought in by carts and trucks, but the boats got the bulk of the traffic.

By the following morning there was at least an acre covered with globular cheeses laid two deep in rows. There seemed enough cheese to feed the world. By nine o'clock buyers were swarming all over the place, men in pants that seemed the forerunner of the widest Oxford bags and otherwise assortedly clad. Each was armed with a butter tester, and throwing back the covering cloth, he picked up a cheese, squeezed it and stabbed it with the tester. He did not taste the cheese, however, merely crumpled it between his thumb and fingers.

When a bargain was struck the principals shook each other's hand most effusively and then porters and weighmen came on the scene. The porters were clad all in white and wore straw hats decked out with ribbons of different colours—each colour on each hat denoting the union or guild to which its wearer belonged. Leather gear over the shoulders was hooked to the handles of long wooden crates, one man in front and another behind, like a military stretcher-bearer. The crated load was then carried into a weighing room where it was placed on a huge set of scales. The weighman, also in the uniform of his union, juggled big iron weights and placed them on the scale until the beam was level. The weight of the load was marked on one of the cheeses with what looked like red raddle or paint. The load was then taken out for delivery. The men carried the load at a stiff-legged trot calling in chorus for the crowd to clear the gangway.

Though the methods seemed rather primitive, the whole market was quickly cleared, and by about eleven o'clock it was almost empty. Export cheese, it was noted, was given a red coat of some substance which, it was said, preserves it in transit.

Holland exports yearly about 80,000 tons of cheese, valued at somewhere about £7,000,000. Dutch exports of butter amount to almost as much, and of milk, either fresh, condensed, or powdered, to about £5,000,000. Hollanders also have established a large business in other dairy products, and well over half a million of Dutch people depend directly on the cow for a living.

It was the Dutch farmer himself, working through his co-operative associations, without waiting for or asking Government assistance, who put the first firm underpinning to the structure of a vast dairying industry in his own country.

Every cheese that is sent to market anywhere in Holland bears an ingenious paper stamp, containing letters, figures, and other symbols, and a statement that means its manufacture and sale is under the supervision of an organisation called the Netherland Cheese Control. By this label every cheese can be traced, if desired, right back to its maker.

[TO BE CONTINUED.]

COLOURATION CHANGES IN BUTTER.

There is a tendency with all stored butter to become deeper in colour on its surface.

The deepening of the surface colour is due to the evaporation of moisture from the surface, which diminishes the number of water droplets, and therefore permits the rays of light to reveal more nearly the natural colour of the butter fat at the surface of the butter.

The deepening of colour in the butter surface is more pronounced in unsalted butter than in butter which is salted in the usual factory procedure.

In salted butter the variation is not so marked. This is due to the affinity of salt for water. As the surface water of the butter evaporates the salt remains, and it draws fresh moisture from surrounding portions of the butter mass, thereby maintaining a more uniform moisture content throughout the butter.

The size of the butter grain and size of the water droplets incorporated in the matter mass has an influence on the uniformity of colour.

Butter manufactured under modern factory conditions, in which the water is thoroughly incorporated in the form of minute droplets, tends to impart stable uniform colour.

REFUSE AS PIG FOOD.

By E. J. SHELTON, H.D.A., Senior Instructor in Pig Raising.

An inquirer asks whether waste bread, stale and burnt cakes and pastry and bakery sweepings generally would be an economic food for pigs and worth buying. He also inquires if waste fruit and vegetables from the markets are good feeding stuffs. In reply we would advise the principal difficulty with all waste food products is to determine at what stage they become risky and detrimental. It is hard to place a commercial value on such products, for musty and mouldy cereal products are liable to cause serious digestive disorders, while rotten fruit and decayed vegetable matter may cause sever gastric trouble and even enteritis.

Similarly, there is invariably a good deal of variation in the quality of these products, and bakery and mill sweepings often contain numerous short pieces of string and bagging, paper, mud and dust, and other foreign matter.

I have often seen mill offal sold at 1s. per bag. This offal was not worth even the price of the containers, for the bags were old second-hands and were mostly useless. The "offal" contained hundreds of dead mice and rats, any amount of waste paper and rubbish, musty and mouldy grain, &c., and was distinctly a dangerous food to use, even when boiled. However, apart from all this, clean, dry, and wholesome stale bread, and burnt cakes, &c., are both economical and useful additions to the daily rations of pigs, so are broken biscuits, biscuit meal, &c. These products are best soaked in hot milk or water for some hours before use, but there is no occasion to boil or cook them. The foods recommended for use in conjunction with these include barley meal, maize meal, milk, pollard, greenstuffs, mineral matters, and drinking water. The purchase price of waste bread, cakes, &c. is difficult to determine; 1s. per bag is too much if there is any musty or mouldy stuff included. Possibly if these foods were valued at less than half the price of, say, pollard, it would give a lead in arriving at a valuation, which would indicate that at about £3 per ton or so they would be economical. Their chemical analysis is equally difficult to arrive at, but they are mostly fattening foods and usually carry a fairly high sugar content.

Waste Fruit.

Of waste fruit it could be said that in general it has a very low commercial value as pig food, and if cartage, bags, or cases are charged for it is doubtful if it could be used economically. Pigs will certainly eat waste fruit and appreciate same, but if it has to be paid for and if payment has to be based on quantity it would be well left alone, unless arrangements could be made for delivery at a very low rate, not including cost of cases or cartage.

To the farmer who has waste fruit and who has no other use for this than as pig food, the product can be utilised to advantage, and when balanced with concentrated meals, &c., it is well worth while; but to have a fruit merchant telephone or advise that he has 500 cases of inferior fruit for immediate sale as pig food at 1s. per case, plus cartage costs, say, 1s. per case, the fruit at 2s. per case, inclusive of all decayed, overheated, or otherwise unsuitable material, is not an attractive proposition, and serious consideration should be given to the matter before a decision is arrived at.

It seems unfortunate that this is the case, but it is so, and unless one has sufficient well-grown and developed pigs to consume the fruit to advantage there would be no profit in the transaction, and probably it would result in loss. Much the same may be said in regard to the tons of cabbage leaves, turnip tops, &c., that are carted away from vegetable markets annually. This class of food is quite good if spread over a grazing area where pigs can pick it up at their leisure as a sort of afternoon snack, but if it has to be paid for in hard cash it is difficult to decide on a commercial value that would be payable to both parties.

The stomachs of very young pigs cannot absorb these foods to the same advantage as can breeding sows, hence waste fruit and the like should not be given to young stock; they should have nothing but the very best of milk, meal, &c., plus greenstuff and minerals. Anything likely to cause gastric disorders is distinctly dangerous to young pigs, and equally so to older stock if it is in an advanced state of decomposition.

Pigs that are accustomed to swill food, waste bread, meat, vegetables, fruit, &c., will grow very much better on this food than where the diet is suddenly changed

from, say, milk and meat to a day or two's entire diet of waste fruit, vegetable leaves, &c.

In all cases the pig troughs and feeding floors should be regularly and efficiently cleaned of all accumulations of left-over food, and this waste matter should be burnt or buried, for when it becomes rancid, sour, or highly decomposed it is decidedly dangerous.

In every instance pigs fed on waste food of this description should have ample supplies of drinking water, and all putrescible food should be thoroughly cooked before use to avoid the risks associated with feeding stuff in a raw condition.

SCHOOL OF INSTRUCTION TO PIG FARMERS AT GATTON COLLEGE.

9th to 19th JUNE, 1930.

Attention is called to the annual school of instruction to pig farmers to be held at the Gatton College during the period 9th to 19th June, 1930. These schools have been organised to provide the means whereby farmers, their sons and daughters, desirous of improving their knowledge of pig raising, may come together at a convenient centre for the purpose of meeting one another and of attending practical demonstrations and lecturettes, indoor studies, &c., on every phase of pig raising.

As early application is necessary, it would be well for those interested to get in touch with the Principal of the College so that arrangements may be made in ample time before the date the school opens.

Professor Murray advises that there need be no fear on the part of the farming community with regard to attendance at this school of members of their families, for provision has been made for accommodation, meals, &c., and those attending can be assured their personal wants will not be overlooked. The social side of the life of these schools is a special feature, while before the lecture session begins opportunity is afforded for a free and easy hour for questions and answers, during which questions relative to any branch of agriculture may be asked. At these sessions officers attend who are interested with other branches of college life, such as the Plant Breeder and the Horticulturalist; in fact, question time is one of the most interesting periods of the day for those interested in orcharding, dairying, &c., as well as pig raising.

The evening cinematograph and lantern lectures are also of much interest and value and are much appreciated. As opportunity offers, prominent authorities on agriculture, apart from departmental officials, give addresses.

An added attraction in the school programme is a visit of inspection to bacon factories, for here the various operations associated with the manufacture of pork products are in full swing. Apart from the educational advantages of such a trip, the day's outing is looked forward to with a great deal of interest by those fortunate enough to attend.

The school fees are exceptionally reasonable (£3 8s. 6d. for the fortnight, covering all expenses), and concession fares on the railways are available to those attending. Further particulars may be obtained by writing to the Principal, Queensland Agricultural High School and College, T.P.O., South Gatton, or from the Department of Agriculture and Stock, Brisbane, Queensland.

It might be mentioned that at the College piggery more than 300 pigs are kept. These comprise representatives of the various breeds in Queensland, and they are bred for stud purposes as well as for the production of pork and bacon. An extensive series of experiments in the breeding of pigs has recently been added to the activities of the pig section. These experiments are under the control of the Departments of Public Instruction and Agriculture and Stock, and of the Queensland Pig Industry Committee as representing the various bacon factories.

Considerable interest is being displayed in the results of crossing the various breeds together, and this section should be of considerable interest to those attending the Pig Farmers' School. Several lecturettes will be arranged to indicate just what is being done, for the objective is to test out under farm conditions prolificacy, suitability, early maturity, and economy of production of various types of pigs. The pig section, therefore, is of the greatest educational value, and one in which farmers generally will be interested.

STOCK LICKS AND MINERAL FEEDS REGISTERED FOR 1930.

By FRED. F. COLEMAN, Officer-in-charge Seeds, Stock Foods, Fertilisers, and Pest Destroyers Branch, Department of Agriculture and Stock,

Under the Stock Foods Acts it is provided that the seller must affix to every package a plainly printed label which must clearly certify in the case of stock licks or mineral feeds—

The number of net pounds in the package;

The distinguishing name or trade mark of the material;

The name and principal address of the Queensland wholesale seller; and

The chemical analysis expressed in the following manner:—

The minimum percentage of phosphoric acid (P_2O_5) and the name of the material from which it is derived;

The minimum percentage of lime when such material has been added;

The minimum percentage of magnesia, which can best be expressed by giving the actual percentage by weight of the magnesium sulphate present;

The minimum percentage of iron and the form in which it occurs. This can best be expressed by giving the actual percentage by weight of the material in the form of, say, iron sulphate or iron carbonate;

The minimum percentage of sulphur as flowers of sulphur or as ground sulphur;

The maximum percentage of salt (sodium chloride).

Where potassium iodide has been added to the mixture, the number of ounces that would be in one ton.

In all stock licks or mineral feeds to which any mixed, concentrated, or prepared stock food or prescribed by-product has been added, the percentage by weight of such added stock food must be expressed on the label. In other words, if the ingredients of the stock lick include molasses, peanut meal, cocoa meal, bran, or other by-products, the percentage of such material must appear on the label.

The label is also required to give the specific name of each of the original materials or ingredients and the proportion or amount of the foreign ingredients.

It is now provided that bone meal, bone dust, or bone flour under whatever name sold for use in stock licks or for feeding purposes must only be made from bones obtained from animals slaughtered for human consumption, and shall be subjected for at least two hours to a steam heat at a temperature of not less than 250 deg. Fahr., equal to an indicated steam pressure of 30 lb. per square inch, and then ground to such fineness as will permit of all passing through an aperture of one-sixteenth of an inch, and at least 95 per cent. through an aperture of one-twenty-fifth of an inch.

Nauru or Ocean Island phosphate is defined as a mineral phosphate from Nauru or Ocean Island containing not less than 37 per cent. of phosphoric acid (P_2O_5), and ground to such fineness as will permit of all passing through an aperture of one-fortieth of an inch, and at least 95 per cent. through an aperture of one-hundredth of an inch.

The stock licks and mineral feeds registered for the current year are as follows:—

STOCK LICKS AND MINERAL FEEDS.

REGISTERED DURING JANUARY, FEBRUARY, MARCH, 1930, FOR THE YEAR ENDING 31ST DECEMBER, 1930.

Queensland Wholesale Dealer.	Sold under the Name of—	Dealer's Guarantee. Minimum Phosphoric Acid P_2O_5.	Dealer's Guarantee. Maximum Salt.	Composed of or Manufactured from—
A.C.F. and Shirley's Fertilizers, Ltd., Roma street, Brisbane	Kwik-Lik	14·0	45·0	Ground rock phosphate, sterilised bone meal, salt, magnesium sulphate, flowers of sulphur, sulphate of iron, and molasses
Australian Disinfectant Co., Albert street, Brisbane	Wagstaff's Medicated Stock Salt	..	90·0	Salt, flowers of sulphur, molasses, soda bicarbonate, aloes, flavouring matter, a trace of iron, 4 per cent. of bran, and contains 20 oz. of potassium iodide to the ton
Thos. Borthwick and Sons (Aust.), Ltd., Wharf st., Brisbane	Borthwick's Bomo Poultry Tonic	12·0	35·0	Sterilised bone meal, lime, salt, powdered sulphur, iron, magnesium sulphate, and contains 1½ oz. potassium iodide per 100 lb.
Ditto	Moreton Bonolik for Stock ..	12·0	45·0	Sterilised bone meal, salt, powdered sulphur, iron, magnesium sulphate, and contains 1½ oz. potassium iodide per 100 lb.
Ditto	Moreton Salbolik	8·0	66·0	Sterilised bone meal and salt
Brabant and Co., Charlotte st., Brisbane	Brablick	14·0	42·0	Sterilised bone meal, fine Nauru phosphate, salt, flowers of sulphur, sulphate of iron, magnesium sulphate, molasses, and contains 14 oz. potassium iodide to the ton
Buzacott's (Qld.), Ltd., Adelaide st., Brisbane	"Lix-all" Vitality Stock Lick	10.0	50·0	Salt, bone char, sulphur, sulphate of iron, magnesium sulphate, molasses, 4 per cent. of wheat by-products, and contains 2 oz. potassium iodide to the ton
Dalgety and Co., Ltd., Elizabeth st., Brisbane	Dalco Stock Lick I.	16·5	35·0	Ground rock phosphate, sterilised bone meal, salt, magnesium sulphate, flowers of sulphur, sulphate of iron, molasses, and contains 16 oz. potassium iodide to the ton
Ditto	Prophylactic Blue Cross Stock Lick	..	83·0	Salt, sulphur, magnesium sulphate, ferrous sulphate, sodium bicarbonate, calcium sulphate, and molasses
Denhams Ltd., Roma st., Brisbane	Iodolik—Mineral Supplement for Sheep—Concentrate	24·0	..	Sterilised bone meal, Nauru phosphate, magnesium sulphate, sulphate of iron, flowers of sulphur, peanut meal, molasses, and contains 30 oz. potassium iodide to the ton
Ditto	Iodolik—Mineral Supplement for Sheep—Dry Grass Formula	13·0	30·0	Sterilised bone meal, Nauru phosphate, salt, magnesium sulphate, sulphate of iron, flowers of sulphur, peanut meal, molasses, and contains 20 oz. potassium iodide to the ton
Ditto	Iodolik—Mineral Supplement for Sheep—Green Grass Formula	17·0	32·5	Sterilised bone meal, Nauru phosphate, salt, magnesium sulphate, sulphate of iron, flowers of sulphur, peanut meal, molasses, and contains 20 oz. potassium iodide to the ton
Ditto	Iodolik—Mineral Supplement for Cattle	16·0	32·5	Sterilised bone meal, Nauru phosphate, salt, magnesium sulphate, sulphate of iron, flowers of sulphur, peanut meal, molasses, and contains 20 oz. potassium iodide to the ton
Ditto	Iodolik—Mineral Supplement for Pigs	12·0	15·0	Sterilised bone meal, Nauru phosphate, carbonate of lime, magnesium sulphate, sodium sulphate, flowers of sulphur, sulphate of iron, bicarbonate of soda, salt, charcoal, meat meal, and contains 20 oz. potassium iodide to the ton
A. Victor Leggo and Co., 72 Albert st., Brisbane	Vigoreen (already mixed) for Sheep	1·8	85·0	Salt, whiting, di-calcium phosphate, magnesium sulphate, iron sulphate, ground sulphur, and contains 7 oz. potassium iodide to the ton
Ditto	Vigoreen (Concentrated) ..	10·9	15·0	Salt, whiting, di-calcium phosphate, magnesium sulphate, iron sulphate, ground sulphur, and contains 43 oz. potassium iodide to the ton
Ditto	Dairy Vigoreen	11·5	32·0	Salt, whiting, di-calcium phosphate, magnesium sulphate, iron sulphate, ground sulphur, and contains 7 oz. potassium iodide to the ton
Ditto	Pig Vigoreen	7·3	17·0	Salt, whiting, di-calcium phosphate, magnesium sulphate, iron sulphate, ground sulphur, and contains 7 oz. potassium iodide to the ton

STOCK LICKS AND MINERAL FEEDS—*continued.*

REGISTERED DURING JANUARY, FEBRUARY, MARCH, 1930, FOR THE YEAR ENDING 31ST DECEMBER, 1930—*continued.*

Queensland Wholesale Dealer.	Sold under the Name of—	Dealer's Guarantee. Minimum Phosphoric Acid P_2O_5.	Dealer's Guarantee. Maximum Salt.	Composed of or Manufactured from—
R. B. Lawson and Co., Stanthorpe . .	Guyra Stock Lick	2·9	85·0	Salt, copper sulphate, Nauru phosphate, sterilised bone meal, magnesium sulphate, molasses, Stockholm tar, and contains 6 oz. potassium iodide to the ton
Mactaggart's Co-operative Association, Ltd., 64 Eagle st., Brisbane	Phospho Sheep and Cattle Lick	18·0	50·0	Nauru phosphate, salt, and contains 16 oz. potassium iodide to the ton
New Zealand Loan and Mercantile Agency Co., Eagle st., Brisbane	Cooper's Medico	. .	. .	Ground sulphur, iron, potassium salts, nicotine, vegetable spices, and tonics
Queensland Pastoral Supplies Ltd., Bowen st., Brisbane	Hibiscus Stock Lick	14·5	40·0	Salt, Nauru phosphate, magnesium sulphate, sulphate of iron, flowers of sulphur, and molasses
Ditto	Hibiscus Iodi ed Stock Lick	14·5	40·0	Salt, Nauru phosphate, magnesium sulphate, sulphate of iron, flowers of sulphur, molasses, and contains 16 oz. potassium iodide to the ton
Ditto	Hibiscus Concentrated Nutrient Stock Lick—Iodised	21·0	. .	Nauru phosphate, sulphate of iron, magnesium sulphate, flowers of sulphur, molasses, 18 per cent. of cottonseed meal, and contains 16 oz. potassium iodide per 2,000 lb.
Ditto	Hibiscus Salt Lick Sulphurized	. .	97·0	Salt and sulphur
Queensland Primary Producers' Co-operative Association, Ltd., Eagle st., Brisbane	"Lix-all" Vitality Stock Lick	10·0	50·0	Salt, bone char., sulphur, sulphate of iron, magnesium sulphate, molasses, 4 per cent. of wheat by-products, and contains 2 oz. potassium iodide to the ton
Webster and Co., Ltd., Mary st., Brisbane	Vita-Lick Concentrated "D"	11·7	. .	Sterilised bone, superphosphate, magnesium sulphate, flowers of sulphur, sulphate of iron, 35 per cent. of rice and cocoa by-products, and contains 16 oz. potassium iodide to the ton
Ditto	Vita-Lick Concentrated "G"	18·5	. .	Sterilised bone, superphosphate, magnesium sulphate, flowers of sulphur, sulphate of iron, 15 per cent. of rice and cocoa by-products, and contains 16 oz. potassium iodide to the ton
Ditto	Vita-Lick Mixed "D" . .	2.1	78·0	Salt, sterilised bone, superphosphate magnesium sulphate, flowers of sulphur, iron sulphate, 7 per cent. of rice and cocoa by-products, molasses, and contains 3 oz. potassium iodide to the ton
Ditto	Vita-Lick Mixed "G" . .	3·4	78·0	Salt, sterilised bone, superphosphate, magnesium sulphate, flowers of sulphur, iron sulphate, 3 per cent. of rice and cocoa by-products, molasses, and contains 3 oz. potassium iodide to the ton
Ditto	Special Cattle Lick Concentrated "D"	20·0	. .	Sterilised bone, superphosphate, magnesium sulphate, iron sulphate, 15 per cent. of rice and cocoa by-products, and contains 16 oz. potassium iodide to the ton
Ditto	Special Cattle Lick Concentrated "G"	22·0	. .	Sterilised bone, superphosphate, iron sulphate, 15 per cent. of rice and cocoa by-products, and contains 16 oz. potassium iodide to the ton
Ditto	Carbofos Medicated Blocks (black)	2·7	82·0	Salt, superphosphate, Nauru phosphate, calcium hydrate, sterilised bone, iron sulphate, and magnesium sulphate
Ditto	Vita-Lick Medicated Blocks (white)	1·5	86·0	Salt, superphosphate, Nauru phosphate, calcium hydrate, iron sulphate, and magnesium sulphate
Ditto	Por-Co-Vite	12·0	35·0	Salt, sterilised bone, carbonate of lime, flowers of sulphur, iron sulphate, magnesium sulphate, and contains 46 oz. potassium iodide to the ton
Ditto	Chic-A-Vite	19·0	. .	Sterilised bone, superphosphate, magnesium sulphate, sulphate of iron, flowers of sulphur, 15 per cent. of peanut meal and rice by-products, and contains 16 oz. potassium iodide to the ton

STOCK LICKS AND MINERAL FEEDS—*continued.*

REGISTERED DURING JANUARY, FEBRUARY, MARCH 1930, FOR THE YEAR ENDING 31ST DECEMBER, 1930—*continued.*

Queensland Wholesale Dealer.	Sold under the Name of—	Dealer's Guarantee. Minimum Phosphoric Acid P_2O_5.	Dealer's Guarantee. Minimum Crude Protein.	Composed of or Manufactured from—
STERILISED BONE MEAL AND FINELY-GROUND NAURU PHOSPHATES.				
A.C.F. and Shirley's Fertilizers, Ltd., Roma st., Brisbane	Gladstone Sterilised Bone Meal	28·0	17·0	Sterilised bones
Ditto	Zillmere Sterilised Bone Meal	24·0	22·0	ditto
Thos. Borthwick and Sons (Aust.), Ltd., Wharf st., Brisbane	Borthwick's Sterilised Bone Meal	24·0	24·0	ditto
The Poultry Farmers' Co-operative Society, Ltd., Roma st., Brisbane	"Red Comb" Sterilised Bone Meal	24·0	22·0	ditto
A.C.F. and Shirley's Fertilizers, Ltd., Roma st., Brisbane	Shirley's Finely Ground Nauru Phosphate Rock	37·0	..	Nauru and Ocean Island phosphate rock

Brisbane, 31st March, 1930.

FERTILISERS REGISTERED FOR 1930.

By FRED. F. COLEMAN, Officer-in-charge Seeds, Stock Foods, Fertilisers, and Pest Destroyers Branch, Department of Agriculture and Stock,

Under "*The Fertilisers Acts*, 1914 *to* 1916" it is provided that every person who desires to sell fertilisers should before selling or on or before the 31st day of January in each year, fill in an application for license form and enclose therewith the prescribed fee of £1 1s., sending same to the Under Secretary, Department of Agriculture and Stock, Brisbane.

Licenses under the Fertilisers Acts remain in force until the thirty-first day of December of the year of issue.

On or before the thirty-first day of January in each year, every licensed dealer is required to fill in and forward to the Under Secretary, or Officer appointed for that purpose, a Certificate of Registration of Fertilisers, setting out the ingredients of each brand of fertiliser that he is selling or proposes to sell, and the percentage of nitrogen, phosphoric acid, potash, and the forms in which these ingredients respectively occur

On the sale of any fertiliser, the licensed dealer must at the time of sale, or before delivery, give the buyer an invoice certificate.

The invoice certificate should be in the form prescribed by the Acts, and is required to set out the name of the licensed dealer, the name of the purchaser, the weight sold, name of fertiliser, including brands or trade mark if such appear on the bags; also, the chemical analysis stating the percentage of nitrogen, phosphoric acid, potash, and the forms in which they respectively occur. In the case of bone dust, meatworks fertiliser, and Nauru phosphate, the percentage of fine and coarse material must be declared.

Every bag of fertiliser sold must have attached thereto a plainly printed label clearly and truly certifying—

(*a*) The number of net pounds of fertiliser in the bag;

(*b*) The figure, trade mark, or other sign under which the fertiliser is sold;

(*c*) The chemical analysis, stating the percentage of nitrogen, phosphoric acid, and potash, and the forms in which they respectively occur, and the percentage of fine and coarse material, &c., as required by the invoice certificate.

It will, therefore, be noted that the only material difference between the invoice certificate and the printed label is that in the former the total weight of the fertiliser is stated, and in the latter the net number of pounds in the bag to which the label is attached.

The invoice certificate must agree with the Certificate of Registration forwarded to the Department of Agriculture.

A producer within the meaning of the Regulations is—

"Any licensed dealer who, whether as manufacturer, importer, or wholesale dealer, is primarily responsible for putting on the Queensland market any fertiliser, and in the case of a producer whose place of business is not within the State of Queensland, the agent of such producer who is resident in Queensland.

Every producer of fertiliser is required to forward a schedule setting out the following particulars:—

(1) The brand under which the fertiliser is known;

(2) The price per ton of the fertiliser, free on rail at Queensland works, or at Brisbane;

(3) The name and address of the manufacturer or importer of the fertiliser;

(4) The place of manufacture; and

(5) The raw materials from which the fertiliser is manufactured or prepared; and if the fertiliser contains mineral rock phosphate, Nauru phosphate, or any organic material such as leather, hoof, horn, hair, wool, waste, peat, garbage, tankage, or similar material, the percentage by weight thereof, and a statement as to the treatment or process (if any) to which the organic material has been subjected.

Producers of fertilisers are also required to furnish to the Under Secretary or other officer appointed for the purpose, a specimen of the printed label for each fertiliser registered.

It is frequently overlooked that a fertiliser is any substance or compound, produced, or prepared in any manner for *fertilising the soil or supplying nutriment to plants,* also any excrement of animals or any natural substance or natural product which is used for fertilising the soil or supplying nutriment to plants. It will, therefore, be noted that any soil or any natural substance or natural product *claimed to supply nutriment to plants comes under the Fertilisers Acts* and is required to be labelled setting out the percentages of nitrogen, phosphoric acid, and potash.

Cases are on record of soil, sludge, and incinerated town refuse being sold and claimed to be worth from 35s. to £5 per ton at seller's station. The material on analysis was found to vary in value from 10s. 9d. to just over £1. Taking the cost of bags into account and the railway freight on ton lots, it is obvious that such material is not worth the cost of transit.

Recently it was found that quite a large trade was being carried on in the Brisbane suburbs and at Ipswich with material claimed by the vendors to contain secret ingredients. On examination of samples and inspection of the premises it was found that the material principally consisted of stable manure, soil, sawdust, road sweepings, and in one case, about 5 per cent. of an ordinary meatworks fertiliser had been added. Cases are reported from North Queensland where material, the residue products of sugar mills, had been collected and sold at prices quite out of proportion to its nitrogen content. Farmers and other buyers would be well advised never to accept delivery of any material unless it has affixed to every package a plainly printed label setting out the percentages of nitrogen, phosphoric acid, and potash, and the forms in which they occur. The buyer should also receive an invoice certificate setting out the particulars that should appear on the labels. Such certificate is the seller's guarantee as to the quality of the material. In the absence of a label or invoice certificate it is obvious that the buyer should refuse delivery.

FERTILISERS REGISTERED BY PRODUCERS DURING JANUARY, FEBRUARY, MARCH, 1930, FOR THE YEAR ENDING 31ST DECEMBER, 1930.

FERTILISERS CONTAINING NITROGEN ONLY.

Registered by the undermentioned as Producers within the meaning of the Regulations.	Name of Fertiliser.	Producers Guarantee Nitrogen as—	
		Sodium Nitrate.	Ammonium Sulphate.
	Sulphate of Ammonia.		
A.C.F. and Shirley's Fertilizers, Ltd., Roma st., Brisbane	A.C.F. Sulphate of Ammonia	..	20·6
A.C.F. and Shirley's Fertilizers, Ltd., Causeway, Townsville	ditto	..	20·6
Fertiliser Distributers, Ltd., E. S. and A. Bank Chambers, Roma st., Brisbane	Sulphate of Ammonia ..	..	20·6
Webster and Co., Ltd., Mary st., Brisbane	"Crown" Brand Sulphate of Ammonia	..	20·0
	Nitrate of Soda.		
A.C.F. and Shirley's Fertilizers Ltd., Roma st., Brisbane	A.C.F. Nitrate of Soda ..	15·6	..
A.C.F. and Shirley's Fertilizers, Ltd., Causeway, Townsville	ditto	15·6	..

FERTILISERS CONTAINING PHOSPHORIC ACID ONLY.

Registered by the Undermentioned as Producers within the Meaning of the Regulations.	Name of Fertiliser.	Producers' Guarantee.				
		Phosphoric Acid.			Fineness.	
		Water Soluble.	Citrate Soluble.	From Nauru and Ocean Island Phosphate	Fine Material.	Coarse Material.
	Superphosphate.					
A.C.F. and Shirley's Fertilizers, Ltd., Roma st., Brisbane	Shirley's High Grade Superphosphate	20·5	0·5	..	..	..
A.C.F. and Shirley's Fertilizers, Ltd., Causeway, Townsville	ditto	20·5	0·5	..	..	..
Fertiliser Distributers, Ltd., E. S. and A. Bank Chambers, Roma st., Brisbane	Superphosphate ..	20·5	0·5	..	..	..
Gibbs, Bright, and Co., Queen st., Brisbane	"Sulphide" Superphosphate	20·5	0·5	..	..	..
Webster and Co., Ltd., Mary st., Brisbane	"Crown" Brand Superphosphate	21·0	..	..	..	..
	Basic Super.					
A.C.F. and Shirley's Fertilizers, Ltd., Roma st., Brisbane	Shirley's Basic Super ..	..	17·0	..	..	..
A.C.F. and Shirley's Fertilizers, Ltd., Causeway, Townsville	ditto	..	17·0	..	..	..
Gibbs, Bright, and Co., Queen st., Brisbane	Sulphide Basic Super ..	3·0	15·0	..	..	..
	Phosphate Rock.					
A.C.F. and Shirley's Fertilizers, Ltd., Roma st., Brisbane	Shirley's Ground Phosphate Rock	..	..	37·0	95	5

FERTILISERS CONTAINING POTASH ONLY.

Registered by the Undermentioned as Producers within the meaning of the Regulations.	Name of Fertiliser.	Producers' Guarantee Potash as—	
		Potassium Sulphate	Potassium Chloride.
	Sulphate of Potash.		
A.C.F. and Shirley's Fertilizers, Ltd., Roma st., Brisbane	A.C.F. Sulphate of Potash ..	48	..
A.C.F. and Shirley's Fertilizers, Ltd., Causeway, Townsville	ditto	48	..
Dalgety and Co., Ltd., Elizabeth st., Brisbane ..	"Stork" Brand Sulphate of Potash	48	..
Denhams Ltd., Roma st., Brisbane	Sulphate of Potash	48	..
Gibbs, Bright and Co., Queen st., Brisbane ..	ditto	48·5	..
Webster and Co., Ltd., Mary st., Brisbane	"Crown" Brand Sulphate of Potash	50	..
	Muriate of Potash.		
A.C.F. and Shirley's Fertilizers, Ltd., Roma st., Brisbane	A.C.F. Muriate of Potash ..	..	50
A.C.F. and Shirley's Fertilizers, Ltd., Causeway, Townsville	ditto	..	50
Dalgety and Co., Ltd., Elizabeth st., Brisbane ..	"Stork" Brand Muriate of Potash	..	50
Denhams Ltd., Roma st., Brisbane	Muriate of Potash	..	50
Fertiliser Distributers, Ltd., E. S. and A. Bank Chambers, Roma st., Brisbane	ditto	..	52

FERTILISERS, THE PRODUCT OF BONE MILLS, MEATWORKS, AND BACON FACTORIES.

Registered by the Undermentioned as Producers within the Meaning of the Regulations.	Name of Fertiliser.	Producers' Guarantee.				
		Nitrogen as Blood, Bone, Flesh and Offal.	Phosphoric Acid from Bone.	Fineness.		
				Fine Material.	Coarse Material.	Unspecified Material.
	Dried Blood.					
A.C.F. and Shirley's Fertilizers, Ltd., Roma st., Brisbane	Dried Blood	12·0	..	76	21	3
Queensland Meat Export Co., Ltd., Mary st., Brisbane	Q.M.E. Meatworks Dried Blood (Eagle Farm)	12·0	..	56	42	2
Ditto	Q.M.E. Meatworks Dried Blood (Ross River)	12·8	..	71	27	2
Swift Australian Co., Ltd., 181 Eagle st., Brisbane	Dried Blood	12·0	..	70	20	10
Swift Australian Co., Ltd., Townsville	ditto	12·0	..	55	35	10
	Bone Dust.					
A.C.F. and Shirley's Fertilizers, Ltd., Roma st., Brisbane	Normanby Bonedust ..	3·6	23·0	60	40	..
Ditto	Runcorn Bonedust ..	3·6	23·0	60	40	..
Ditto	Shirley's Bone Dust ..	3·5	23·5	70	30	..
Denhams Ltd., Roma st., Brisbane ..	Sterilised Bone Flour ..	1·0	30·0	85	15	..
Fertiliser Distributers Ltd., E. S. and A. Bank Chambers, Roma st., Brisbane	FDL Brand Vitalized Bone Meal	3·0	22·0	70	30	..
Swift Australian Co., Ltd., 181 Eagle st., Brisbane	Bone Meal	3·0	24·0	35	65	..
Swift Australian Co., Ltd., Townsville ..	ditto	3·0	24·0	35	65	..
	Blood, Bone, Flesh, and Offal.					
A.C.F. and Shirley's Fertilizers, Ltd., Roma st., Brisbane	Blood and Bone	5·0	14·0	65	22	13
Thos. Borthwick and Sons (Aust.), Ltd., Wharf st., Brisbane	Brooklyn Fertilizer ..	6·6	12·1	71	24	..
Queensland Co-operative Bacon Association, Ltd., Murarrie	Atlas Brand Fertiliser..	6·5	12·2	84	14	2
Queensland Meat Export Co., Ltd., Mary st., Brisbane	Q.M.E. Meatworks Fertilizer Plain Milled (Eagle Farm)	4·6	18·9	71	23	6
Ditto	Q.M.E. Meatworks Fertilizer Mixed Milled (Eagle Farm)	6·7	13·0	44	42	14
Ditto	Q.M.E. Meatworks Fertilizer Plain Milled (Ross River)	5·8	17·2	79	19	2
Swift Australian Co., Ltd., 181 Eagle st., Brisbane	Meatworks Fertiliser ..	5·5	10·0	55	45	..
Swift Australian Co., Ltd., Townsville ..	ditto	5·0	15·0	55	45	..
Webster and Co., Ltd., Mary st., Brisbane	Crown Bone and Offal Mixture	2·7	21·0	68	30	.

MIXED FERTILISERS (MECHANICAL MIXTURES).

Registered by the Undermentioned as Producers within the Meaning of the Regulations.	Name of Fertiliser.	Producers' Guarantee.										
		Nitrogen as—		Phosphoric Acid.				Potash as—		Fineness.		
		Ammonium Sulphate.	Blood, Bone, Flesh, and Offal.	Water Soluble.	Citrate Soluble.	From Bone.	From Rock Phosphate.	Sulphate.	Chloride.	Fine Material.	Coarse Material.	Unspecified Material.
A.C.F. and Shirley's Fertilizers, Ltd., Roma st., Brisbane	A.C.F. No. 1	2·0	3·0	..	..	13·0	..	8·0	..	60	40	..
Ditto	A.C.F. No. 3	3·5	1·5	4·0	..	10·0	..	..	7·0	60	40	..
Ditto	A.C.F. B3	5·5	1·5	4·0	..	6·0	..	..	10·5	60	40	..
Ditto	A.C.F. No. 4	2·0	2·0	2·0	..	9·0	..	12·0	..	60	40	..
Ditto	A.C.F. No. 5	2·0	1·5	5·0	..	7·0	..	..	12·0	60	40	..
Ditto	A.C.F. "Three 6"	3·75	1·25	5·0	..	7·0	..	4·0	3·0	60	40	..
Ditto	A.C.F. No. 8	..	2·0	5·0	..	12·0	..	9·0	..	60	40	..
Ditto	A.C.F. Threights 8.8.8.	8·0	..	8·0	..	..	..	8·0	..	..	..	..
Ditto	A.C.F. Trinine 9.9.9.	7·6	1·4	..	..	9·0	..	9·0	..	60	40	..
Ditto	A.C.F. No. 12 (Muriate)	4·0	1·5	..	..	8·0	..	..	18·0	60	40	..
Ditto	A.C.F. Badgen Fertilizer	2·0	2·5	3·0	..	9·5	..	12·0	..	60	40	..
Ditto	A.C.F. Bone and Super.	..	1·7	11·0	..	10·0	..	..	..	60	40	..
Ditto	A.C.F. Planting Mixture	..	1·0	14·0	..	3·0	..	..	7·5	60	40	..
Ditto	A.C.F. Kwikgro	2·5	1·5	..	..	14·0	..	7·0	..	90	10	..
Ditto	Shirley's Fertilizer No. 5	3·0	..	12·0	..	..	..	7·0	..	..	..	..
Ditto	Shirley's Fertilizer Q. 5. Mixture	4·0	..	12·0	..	..	..	10·0	..	..	..	..
Ditto	Shirley's Fertilizer No. 8	4·1	..	16·4	..	..	..	..	..	..	..	..
Ditto	Shirley's Fertilizer No. 11	..	..	15·5	..	..	..	4·0	..	..	..	..
Ditto	Shirley's "Bana" Fertilizer	4·0	..	5·0	5·0	..	..	13·0	..	..	..	..
Ditto	Shirley's Howes' Mixture	9·0	..	..	6·0	..	..	11·0	..	..	..	..
Ditto	Shirley's Howes' Mixture (Meatworks Base)	6·5	2·5	..	..	7·0	..	11·0	..	71	26	3
Ditto	Shirley's "Tropic" Fertilizer	1·75	3·25	..	..	12·0	..	10·0	..	75	25	..
A.C.F. and Shirley's Fertilizers, Ltd., Causeway, Townsville	A.C.F. B. 3 Extra	6·0	1·0	3·0	..	3·4	3·6	10·0	..	80	20	..
Ditto	A.C.F. B. 3 Muriate	6·0	1·0	3·0	..	3·4	3·6	..	10·0	80	20	..
Ditto	A.C.F. B. 3 Northern	6·0	1·0	4·5	..	2·0	2·0	..	12·5	80	20	..
Ditto	A.C.F. Trinine 9.9.9.	7·4	1·6	..	..	9·0	..	..	9·0	80	20	..
Ditto	A.C.F. Bone and Super	..	1·7	11·0	..	10·0	..	..	..	60	40	..
Ditto	A.C.F. Howes' Mixture	6·5	2·5	..	..	7·0	..	11·0	..	80	20	..
Ditto	A.C.F. Howes' Mixture (with Muriate of Potash)	6·5	2·5	..	..	7·0	..	..	11·0	80	20	..
Ditto	A.C.F. Magnetic	8·0	1·0	2·0	..	2·0	2·0	12·5	..	80	20	..
Ditto	Shirley's Improved Drill Mixture	3·0	1·0	4·5	..	2·0	5·5	..	13·0	80	20	..
Ditto	Shirley's "Organik" Fertilizer	4·0	1·5	4·5	..	2·5	..	10·0	..	80	20	..

Thos. Borthwick and Sons (Aust.), Ltd., Wharf st., Brisbane	Moreton Fertilizer No. 1	..	4·6	..	..	14·4	..	9·6	..	72	24	..
Ditto	Moreton Fertilizer No. 2	..	5·3	..	..	16·2	..	4·8	..	81	15	..
Ditto	Moreton Fertilizer No. 3	2·0	3·4	3·3	..	10·6	..	7·6	..	80	17	..
Fertiliser Distributers Ltd., E. S. and A. Bank Chambers, Roma st., Brisbane	F.D.L. Mixture No. 3	2·0	1·25	2·0	..	9·5	2·0	..	4·5	80	20	..
Ditto	F.D.L. Mt. Etna No. 4 Fish ..	2·5	2·0	..	..	13·25	1·0	..	6·5	80	20	..
Ditto	F.D.L. Orchard Mixture No. 5 ..	2·0	2·25	..	..	13·25	1·0	..	8·0	80	20	..
Ditto	F.D.L. Ratoon No. 6	4·5	2·0	..	..	12·25	..	..	10·0	80	20	..
Ditto	F.D.L. Mixture No. 10	7·75	1·25	..	..	7·25	..	..	11·0	80	20	..
Gibbs, Bright, and Co., Queen st., Brisbane	G.F.3. Special Fertilizer	7·0	..	9·5	0·5	..	..	10·0	..	..	..	..
Ditto	Howes' Mixture	9·0	..	6·0	..	..	..	11·0	..	..	..	..
Ditto	S.C. No. 4 Special Fertilizer ..	4·0	..	13·0	..	..	..	8·0	..	..	..	..
Ditto	Special A1 Cane Fertilizer	7·0	..	6·5	..	..	..	7·0	..	..	..	..
J. C. Hutton Pty., Ltd., Roma st., Brisbane	Hutton's Special Fertiliser	..	5·0	3·5	..	11·0	..	..	..	70	22	8
Ditto	Hutton's Special Complete Fertiliser	..	4·5	3·2	..	9·8	..	5·0	..	70	22	8
Webster and Co., Ltd., Mary st., Brisbane	"Crown Brand" Special Complete No. 1	4·0	..	13·5	..	..	..	7·0	..	..	..	..
Ditto	"Crown" Mixture No. 2	2·0	2·0	..	..	15·75	..	7·0	..	75	25	..
Ditto	"Crown" Mixture No. 3	3·25	2·0	..	..	16·0	..	3·5	..	75	25	..
Ditto	"Crown" Mixture No. 4	2·75	2·25	..	..	18·0	..	..	..	75	25	..

SYNTHETIC FERTILISERS.

Registered by the Undermentioned as Producers within the Meaning of the Regulations.	Name of Fertiliser	Producers' Guarantee.	
			Per cent.
Abel Lemon and Co., Pty., Ltd., Market st., Brisbane	Diammonphos (Floraphos)	Nitrogen	20·0
		Phosphoric Acid, Water Soluble	52·0
Ditto	Floranid	Nitrogen as Urea	46·0
Ditto	Nitrophoska	Nitrogen	16·5
		Phosphoric Acid	16·5
		Potash	21·5

Brisbane, 31st March, 1930.

CLIMATOLOGICAL TABLE—MARCH, 1930.

SUPPLIED BY THE COMMONWEALTH OF AUSTRALIA METEOROLOGICAL BUREAU, BRISBANE.

Districts and Stations.	Atmospheric Pressure. Mean at 9 a.m.	Shade Temperature. Means. Max.	Means. Min.	Extremes. Max.	Date.	Min.	Date.	Rainfall. Total.	Wet Days.
Coastal.	In.	Deg.	Deg.	Deg.		Deg.		Points.	
Cooktown	29·90	86	76	89	20	72	7,8	1,129	13
Herberton	..	78	62	84	23	52	7	377	10
Rockhampton	30·01	86	68	90	17	65	5	102	10
Brisbane	30·09	81	65	87	19	60	26	285	20
Darling Downs.									
Dalby	30·07	83	59	90	8	54	3,26,27, 30,31	262	5
Stanthorpe	..	76	55	84	8	46	26	230	10
Toowoomba	..	75	58	83	17,18	52	5,22	168	12
Mid-interior.									
Georgetown	29·89	91	66	96	17	59	7,23,24	23	2
Longreach	29·96	94	67	100	7	61	20,22	57	2
Mitchell	30·04	87	62	95	7,10	51	24	99	5
Western.									
Burketown	29·89	90	72	96	17,18,24	65	23,24	431	4
Boulia	29·92	97	69	104	10	61	27	30	1
Thargomindah	29·99	92	68	101	9	61	25	..	..

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF MARCH, IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALL DURING MARCH 1930 AND 1929, FOR COMPARISON.

Divisions and Stations.	Average Rainfall. Mar.	No. of Years' Records.	Total Rainfall. Mar., 1930.	Mar., 1929.
North Coast.	In.		In.	In.
Atherton	8·93	29	3·10	8·87
Cairns	18·20	48	14·22	29·66
Cardwell	16·17	58	7·64	25·84
Cooktown	15·32	54	11·42	10·39
Herberton	8·14	43	3·77	10·45
Ingham	15·63	38	18·51	26·25
Innisfail	26·38	49	38·03	26·46
Mossman	17·58	17	14·91	19·93
Townsville	7·56	59	1·02	9·91
Central Coast.				
Ayr	6·90	43	0·66	16·66
Bowen	5·85	59	0·64	7·41
Charters Towers ..	3·92	48	2·51	7·61
Mackay	12·40	59	4·54	11·74
Proserpine	12·65	27	7·01	15·19
St. Lawrence.. ..	5·53	59	0·51	1·98
South Coast.				
Biggenden	3·94	31	5·49	2·02
Bundaberg	5·26	47	1·77	2·49
Brisbane	5·71	79	2·85	6·59
Caboolture	7·69	43	4·30	8·53
Childers	4·67	35	1·12	3·02
Crohamhurst ..	11.41	37	7·25	7·36
Esk	4·97	43	2·87	9·53
Gayndah	3·11	59	0·77	1·06
Gympie	6·29	60	3·06	4·18
Kilkivan	3·94	51	1·99	1·22
Maryborough ..	6·09	58	3·05	2·50

Divisions and Stations.	Average Rainfall. Mar.	No. of Years' Records.	Total Rainfall. Mar., 1930.	Mar., 1929.
South Coast—continued:	In.		In.	In.
Nambour	9·37	34	7·72	7·57
Nanango	3·50	48	1·42	2·84
Rockhampton ..	4·67	43	1·02	3·67
Woodford	8·07	43	4·00	7·72
Darling Downs.				
Dalby	2·76	60	2·62	4·10
Emu Vale	2·51	34	1·49	4·12
Jimbour	2·62	42	3·18	3·05
Miles	2·73	45	1·60	4·23
Stanthorpe	2·70	57	2·30	3·82
Toowoomba ..	3·85	58	1·68	5·65
Warwick	2·58	65	1·25	4·34
Maranoa.				
Roma	2·66	56	0·25	2·57
State Farms, &c.				
Bungeworgorai ..	1·63	16	0·22	2·23
Gatton College ..	3·25	31	3·56	4·15
Gindie	2·64	31	3·18	2·42
Hermitage	2·28	24	..	4·14
Kairi	8·40	16	2·24	7·88
Mackay Sugar Experiment Station ..	11·51	33	4·39	12·17
Warren	2·68	15	..	3·03

GEORGE G. BOND, Divisional Meteorologist.

Answers to Correspondents.

BOTANY.

The following answers have been selected from the outgoing mail of the Government Botanist, Mr. C. T. White, F.L.S.:—

Dawson Valley Plants Identified.

D.H. (Theodore, Dawson Valley).—Your specimens are:—

1. *Panicum globoideum,* Shot Grass, a grass much relished by stock, highly nutritious and one of the best pasture grasses we have. It is well worth propagating on your property.
2. *Aristida* sp., the Three-pronged Spear Grass. The Aristidas or Spear Grasses are only useful as fodders in their very young stages, soon coming into seed and proving unpalatable to stock. Their value as forage is very little.
3. The specimen imperfect, but seems to be *Bryonia laciniosa,* the native Bryony, a poison vine. See pamphlet for further particulars.
4. *Vitis opaca,* a small native grape; not poisonous.
5. *Solanum* sp., a species of Potato Bush. These plants are very common in the average mixed native pasture in Western Queensland, and the green berries of most sorts possess solanine—a poisonous alkaloid—but apparently trouble from them is not very common.
6. *Malvastrum spicatum,* a common weed of the mallow family, of which I have not heard a common name.
7. *Sida corrugata.* The same remarks as apply to No. 6.
8. A plant of the *Chenopodiaceae,* or Salt Bush family; a bigger specimen is required for identification. Plants of this family are not generally regarded as poisonous, and most are recognised as useful fodders.

Regarding your query about *Agave,* these plants are not known to be poisonous.

Your letter is being referred back to the Chief Inspector of Stock, Major A. R. Cory, M.R.C.V.S., for further report.

A Native Dodder.

W. (Winton)—

Your specimen proved to be *Cuscuta australis,* a native dodder. The dodders are parasitic plants which soon leave the ground and become wholely parasitic on other plants. One of them is a very bad weed in Queensland and New South Wales on lucerne. The one you send is a native species and is most abundant on the coast. We have had very few specimens from inland parts, but this season, in addition to your specimen, we have received material from Saltern and Longreach, so evidently it is fairly common. It has the power of becoming a bad weed as it attacks cultivated plants as well as native herbage and weeds, though it is most frequently found on the latter. It is not known to be poisonous in any way, though if stock eat it in quantity it might cause mechanical injury by its stringy nature, but on this point we are doubtful.

Panicum palmifolium. Subterranean Clover. Molasses Grass.

J.T. (Yeppoon)—

Your grass specimen is *Panicum palmifolium,* a native of Tropical Asia, cultivated fairly extensively in most warm countries as an ornamental garden species. We do not know that it has any particular value as a fodder, but if you wish to try it out the plant is easily propagated by root division.

The Department does not stock seed of Subterranean Clover, but seed is obtainable through the ordinary commercial channels. We rather doubt, however, if you will have success with this species as far north as Yeppoon and think the best species would be the ordinary White Dutch Clover.

We do not know anybody stocking seed of Molasses Grass, but if you write to Mr. N. A. R. Pollock, Northern Instructor in Agriculture, Townsville, he might be able to put you on to a supply. The grass is grown to a limited extent in northern New South Wales, and if you wrote to Mr. J. N. Whittet, Agrostologist, Department of Agriculture, Sydney, New South Wales, he might be able to give you some information.

Pig Weed.

H.B.R. (Torrens Creek)—

Your specimen is a species of Pig Weed, *Portulacca filifolia.* It is not known to be poisonous, but the Pig Weeds, like many other succulent plants, if eaten in quantity by hungry stock are apt to bloat them severely; death, especially in the cases of travelling stock, sometimes occurring. They are not known, however, to possess any actual poisonous principle, and in fact are generally regarded as useful forage.

Rag Weed.

A.W.F. (West Burleigh)—

Your specimens represent *Ambrosia maritima,* the common Rag Weed, a native of the Mediterranean region naturalised here and there in Australia. We have had it from the neighbourhood of Burleigh and Currumbin as far back as 1915, but it does not seem to become abundant and has spread to no other locality so far as we know. It has, however, a possibility of becoming a bad weed, and on this account should be destroyed.

Panicum adspersum.

INQUIRER (Hughenden)—

The grass is *Panicum adspersum,* a native species of Panic Grass. Like other rather succulent broad-leaved members of the genus Panicum, it is a good fodder and should make excellent hay. The grass was very interesting to us as it was the first specimen we had received from Queensland, though it has been recorded for Central Australia and Northern Territory.

Datura ferox.

R.A.T. (Atherton, N.Q.)—

The specimen is *Datura ferox,* a species of Stramonium or Thorn Apple, naturalised in Queensland for some years past. The only previous locality we had for it, however, was the western Darling Downs, and this apparently is the first time the plant has made its appearance in North Queensland. Like all other members of the genus it is poisonous, and hence should be destroyed as far as possible from paddocks where it makes its appearance.

PEDIGREED STOCK—IMPORTATIONS FROM BRITAIN.

The scheme to encourage the importation of pedigree livestock from the United Kingdom into Australia by an arrangement with the shipping companies to carry the animals freight free, which has been under discussion for some years past, has been finalised, and will remain in operation till 30th September, 1931.

It is applicable only to pedigree breeding cattle, sheep, and swine produced in the British Isles, and purchased by the applicant in and imported from the United Kingdom to Australia. The main points in the scheme are: (1) that the cost of purchase must be borne by the applicant, (2) the shipping companies (with one exception) have agreed to carry the stock freight free, and (3) all other approved incidental expenses (insurance excepted) connected with the transport of the stock from the port of export in the United Kingdom to the port of import in Australia will be shared equally by the applicant, the Commonwealth and State Governments (equally), and the Empire Marketing Board.

The scheme will only apply to animals for which a certificate of full registration by a recognised stud society is furnished, together with the vendor's certificate of breeding and production record (if any), and also a certificate that the animals conform to the registered society's standard in respect of type and soundness.

Applicants must not dispose of any of the stock within a period of two years without the permission of the Minister for Agriculture, and must, at their own expense, keep every animal insured in the joint name of the applicant and the Minister. They must also make the necessary arrangements for shipment and transport, and pay the whole of the expenses, claiming on the Department of Agriculture in their State for reimbursement of the amount due by the Commonwealth and State Governments and the Empire Marketing Board.

General Notes.

Honey Board Election.

The annual election of four members for the Honey Board resulted as follows:—

Robert Victor Woodrow (Woodford)	224 votes.
Henry Edgar Fagg (South Killarney)	218 "
Owen Norman Tanner (Samford)	186 "
John Schutt (Holstein Park, Perthton)	183 "
John Duncan Colin Campbell (Hillview, Beaudesert) ..	64 "
Alexander Roy Brown (Park Ridge)	56 "
Augustus Frederick Spry (Clayfield)	50 "
Charles William Edwards (Greenbank, Kingston)	43 "

All growers owning not less than five hives of bees in movable frames and market the honey and beeswax therefrom were eligible to vote, and three of the present members (Messrs. Woodrow, Fagg, and Schutt) were re-elected. Mr. Pickering did not seek re-election, and his place will be taken by Mr. O. N. Tanner.

Messrs. R. V. Woodrow (Woodford), H. E. Fagg (South Killarney), O. N. Tanner (Samford), J. Schutt (Holstein Park, Perthton), have been appointed members of the Honey Board as from the 16th April, 1930, to 15th April, 1931.

Staff Changes and Appointments.

Mr. C. D. Hogan has been further seconded for duty as Senior Clerk (Accounts), Agricultural Bank, Brisbane, for three months as from 12th March, 1930.

Mr. P. D. Edwards has been appointed Government Representative on the Bulloo Dingo Board.

Mr. A. K. Williams has been appointed a Ranger under the Animals and Birds Acts, at Rockhampton, and Mr. J. E. Jones has been appointed a Temporary Ranger under the abovementioned Acts, with headquarters at Dalby.

The appointments of Messrs. E. R. Boyd and S. E. Pegg as Inspectors under the Dairy Produce Act have been confirmed as from 2nd September and 16th September, 1929, respectively.

Mr. J. C. Sabine, of Stanthorpe Border Gate, has been appointed an Inspector of Stock; Mr. H. B. Ford has been appointed an Inspector of Stock on probation. Mr. P. J. Short has been appointed a Temporary Inspector of Slaughterhouses, at Warwick.

The appointment of Mr. L. R. Macgregor as a Member of the Committee of Direction of Fruit Marketing until the 31st December, 1930, has been cancelled, and in his place Mr. E. Graham, Director of Marketing, or, in his absence, a Deputy to be appointed by the Minister, has been appointed a Member of the Committee of Direction until the 31st December, 1930.

Mr. J. L. F. Foran, Chemist, Stock Experiment Station, Townsville, has been appointed Analyst, Agricultural Chemical Laboratory, Brisbane, as from 1st March, 1930.

Mr. J. C. Pryde has been appointed a Temporary Inspector of Stock at Maryborough for the period from 22nd April, 1930, to 19th May, 1930, in order to relieve Mr. J. Taylor, District Inspector of Stock at Maryborough, who will be on leave for that period.

Acting Sergeant E. M. James, Officer in Charge of Police, South Johnstone, has been appointed an Inspector of Slaughter-houses; the services of Mr. P. J. Short, Temporary Inspector of Slaughter-houses at Warwick, have been continued for the period from 1st April to 30th April, 1930.

Approval has been given to the Queensland Cane Growers' Council to appoint Mr. William McRobbie, of Silkwood, South Johnstone, to be a Member to complete the representation of the South Johnstone Mill Suppliers' Committee.

The appointment of Mr. G. A. Cameron, Police Magistrate, Townsville, as Chairman of the Inkerman, Invicta, Kalamia, and Pioneer Local Sugar Cane Prices Boards has been cancelled, and, in lieu thereof, Mr. T. R. Kennedy, Police Magistrate, Bowen, has been appointed Chairman of those Local Boards.

Mr. J. W. Weir has been appointed a Temporary Ranger under the Animals and Birds Acts at Goondiwindi; and the headquarters of Mr. J. H. Jones, Temporary Ranger at Dalby, have been changed for the present to Mungindi.

Close Season for Ducks.

The present close season for ducks, which commenced on 1st October, 1929, was due to end on the 30th April, 1930. Owing to the proximity of the Easter holidays to this date, is was desired to give sportsmen the opportunity of shooting ducks during these holidays, and consequently an Order in Council has been passed ending the close season for ducks at midnight on the 17th April instead of on the 30th April, 1930. This applies only to No. 1 District for the purposes of the Animals and Birds Acts, as described in an Order in Council of the 27th March, 1930, comprising the southern part of Queensland.

Smuts of Barley—Seed Treatment.

Seed treatment with copper carbonate is not completely effective in the control of smut in oats, apparently because some of the spores are protected by the enclosing husks of the oat grain. Nor, except in the case of Skinless, is the copper carbonate treatment effective in the control of covered smut of barley. Varieties other than that mentioned should be treated by thoroughly sprinkling a heap of the seed with formalin solution (1 pint to 40 gallons water) and covering the wet heap with a bag for four to six hours to allow the vapour of the formalin to penetrate the mass. Sowing should then be carried out soon after treatment in a moist, well-prepared seed-bed.

Where formalin is used, seed should be obtained from clean crops where practicable and sowing should not be made in land infected by the smut.

Fungicide treatments of barley seed infected with loose or flying smut are unsatisfactory. The most practicable method of avoiding this disease is to select seed from crops that are free, which can be most effectively accomplished by growing a seed plot for the production of smut-free seed for the main crop. If seed treatment is to be used the hot-water method is best. The temperature used should be 52 deg. Cent. (126.6 deg. Fah.) and the time of immersion fifteen minutes.—"A. and P. Notes, New South Wales Department of Agriculture."

Government Representation.

The Minister for Agriculture and Stock, the Hon. Harry F. Walker, has announced that, in pursuance of "*The Primary Producers' Organisation and Marketing Acts,* 1926 *to* 1928," he had appointed Mr. E. Graham, Under Secretary, Department of Agriculture and Stock, and Director of Marketing, to be a Member of the following Boards for the periods set out hereunder:—

Board.	Term of Office. From.	To.
Arrowroot	1st April, 1930	14th April, 1931.
Atherton Maize	1st April, 1930	31st March, 1931.
Atherton Pig	1st April, 1930	31st December, 1930.
Butter	1st April, 1930	30th June, 1931.
Broom Millet	1st April, 1930	10th March, 1931.
Canary Seed	1st April, 1930	28th February, 1931.
Cheese	1st April, 1930	31st July, 1930.
Cotton	1st April, 1930.	31st December, 1931.
Egg	1st April, 1930	30th April, 1931.
Honey	1st April, 1930	15th April, 1931.
Peanut	1st April, 1930	31st August, 1930.

Mr. Graham has also been appointed a Member of the Queensland Wheat Board until the 31st August next.

As it will be impracticable for Mr. Graham to attend all meetings of the Commodity Boards at the present time, Deputies have been appointed to represent him on those Boards. Mr. H. C. Quodling, Director of Agriculture, will attend meetings of the Wheat Board and the Canary Seed Board; Mr. A. E. Gibson, Senior Instructor in Agriculture, will attend meetings of the Arrowroot, Broom Millet, Honey, and Peanut Boards; Mr. C. McGrath, Supervisor of Dairying, has been chosen as Government Representative on the Butter and Cheese Boards; Mr. C. L. Hassell, Instructor in Agriculture, Atherton, on the Atherton Maize and Atherton Pig Boards; Mr. W. G. Wells, Cotton Specialist, on the Cotton Board; while Mr. P. Rumball, the Poultry Expert, will be the representative on the Egg Board. Although Mr. Graham has had Deputies appointed to attend meetings in his stead, this will not preclude him from giving any assistance that he may render at any time to any of the Commodity Boards that have been constituted in Queensland.

Colour Standards for Tomatoes.

A Regulation providing for colour standards for Tomatoes as "Ripe," "Coloured," or "Green," was passed on the 7th November, 1929. However, since then it has been found impracticable for tomato growers and packers to conform to these standards, and, as a result, a further Regulation has now been passed, rescinding the previous Regulation of the 7th November, 1929, which set up the abovementioned standards.

Pig Levy Regulations.

Additional Regulations have been made under "*The Fruit Marketing Organisation Acts,* 1923 *to* 1928," relating to a levy on figs. The Regulations are numbered from 179 to 186, and empower the Committee of Direction of Fruit Marketing to make a levy on all figs delivered to canners.

As the present crop of figs was estimated to be much in excess of the quantity that the canners offered to take, a meeting of fig growers decided to institute a levy on themselves that, in consideration of the canners taking an extra 20 tons, they might advertise to help clear this extra quantity. A ballot of fig growers being taken resulted in a majority in favour of the levy, and accordingly the new Regulations have been passed.

The Regulations provide that—

The Committee of Direction is empowered to make a levy on the growers of all figs delivered to canners from 1st January to 30th April, 1930, both inclusive.

The levy shall be on the basis of the net weight of figs delivered by them, and shall be at the rate of £2 per ton, and/or a proportionate part of £2 for each portion of a ton.

The amount of such levy shall be deducted by the Committee of Direction from amounts payable to growers on figs delivered to canners, and levy payable by any growers on figs for which they have already received payment shall be deducted from amounts later payable to such growers. All sums raised by the said levy shall be expended upon advertising in the interests of the fig growers concerned. Any fruit-grower who shall fail to pay the levy shall be guilty of an offence, and be liable to a penalty not exceeding £20, without prejudice to his liability to pay the amount of the levy. The levy shall be deemed to have been made upon the advertisement in at least one paper circulating throughout that part of the State concerned, of a resolution passed by the Committee of Direction of Fruit Marketing.

Profitable Pigs—Can any Other Reader Beat This?

Messrs. Baker Bros., of West Haldon, Greenmount, write:—

In your March issue of the Journal you ask can anyone beat Mr. Nugent's net profit of £5 from pigs for every dairy cow kept. I submit here our net profits from pigs for the last four years.

	£	*s.*	*d.*
1926.—Total milch cows kept on farm, 25.			
Net profit from pigs	229	12	9
1927.—Same number of cows.			
Net profit from pigs	153	15	10
1928.—Same number of cows.			
Net profit from pigs	148	16	5
1929.—Total milch cows kept this year, 27.			
Net profit from pigs	256	3	4

This works out at average for the four years mentioned of £7 14s. 6d. net profit from pigs for every dairy cow kept on our farm or owned by us. We did not purchase any feed for pigs over this period, other than lime and salt, the cost of which was under £2 in all. Pig feed has been grown on the farm.

I do not desire to say anything of our system of feeding more than that it is as near as we can practically follow what Professor Murray, of Queensland Agricultural High School and College, has been teaching for years, and I merely mention this to demonstrate the soundness of Professor Murray's teaching.

If these figures seem doubtful, we invite you or any of your fellow officers to inspect our books. We purchased pigs over the fours years mentioned, and all pigs were sold to Darling Downs Bacon Co.

We enclose herewith sum of 3s. as subscription (renewal) to the Agricultural Journal for the next three years.

Canary Seed Board.

The term of office of the Canary Seed Board constituted in December, 1927, expired on 28th February, 1930. On the 16th January, 1930, notice was given of the intention of the Governor in Council to extend the operation of the Canary Seed Board for a further three years. Opportunity was given to growers to petition against the issuing of an Order in Council extending the operations of the Board, but no petition was received. Consequently, an Order in Council has now been passed extending the operations of the Canary Seed Board for a further period from the 1st March, 1930, to the 28th February, 1933.

Hand Boring Outfit.

A hand-boring plant, useful for locating water has been used with good results at Cowra Experiment Farm, New South Wales. It consists of an ordinary 2-inch wood-boring auger, preferably with a screw point cut-off, and rods of ½-inch or ⅝-inch iron of sufficient length for the required depth. The iron rods comprise one short rod of about 3 ft. 6 in. in length and the remainder about 6 ft. 6 in. or 7 ft. long, each with a close hook at one end and an eye at the other end. Both the hooks and eyes require to be made small enough to pass easily down the 2-inch bore. Any blacksmith can make the rods.

A bar of ⅝-inch iron about 1 ft. 8 in. long is necessary to pass through the eye of the uppermost rod to turn the auger. An eye is also necessary on the auger, so that the rods can be hooked into it.

A commencement is made by boring the auger into the ground, withdrawing it, of course, to raise the earth to the surface, until the eye gets near the ground. The short rod is then attached and boring continued until the eye of it reaches almost to the ground surface. The auger is then withdrawn and one of the long rods attached to it, and boring continued until the eye of the long rod reaches almost to the ground, when the short rod is attached to it and boring continued until another long rod becomes necessary.

Barley Board.

On 23rd January, 1930, the Governor in Council gave notice of intention to make an Order in Council creating a Barley Board for seven years, and called for a petition for a poll to decide whether the Order should be made. A petition was handed in, and accordingly a poll was held on the 17th April, 1930, the result being 117 votes in favour of the setting up of a Barley Board, and 27 against. As the required 60 per cent. majority was procured, an Order in Council has now been made, setting up a Barley Board for a period of seven years. The Order in Council provides:—

1. All barley produced in Queensland for seven years from the date of this Order shall be a commodity under and for the purposes of the Primary Producers' Organisation and Marketing Acts.

2. There is constituted a Board in relation to barley, consisting of two elected representatives of growers and the Director of Marketing; the growers' representatives to be elected annually.

3. The Board shall be a Marketing Board.

4. All persons who, during the twelve months preceding any poll or election held in connection with the said commodity, harvested for sale barley in any part of Queensland, shall be eligible to vote.

5. The whole of the said commodity shall, upon the making of this Order, be divested from the growers thereof and become vested in and become the property of the Board as the owners thereof.

6. The provisions of the Acts are hereby extended to the said commodity and the said Board and all persons, things, and matters concerned.

The question of the constitution of a Barley Board for a period of seven years was submitted to barley growers, and the voting was as follows:—

For	117 votes.
Against	27 „

A ballot for the election of two members on this Board was also taken with this result:—

George Burton (Cambooya)	124 votes.
Michael Coleman (Nobby)	115 „
Harry Obst (Shepperd)	47 „

Are We Practical?

"I came once more on the real Goethe when it struck me in connection with his activities that he could not think of any intellectual employment without practical work side by side with it."—Dr. ALBERT SCHWEITZER.

Young Farmers and the Scrub Bull.

A notable endeavour is being made by an English young farmers' club in the direction of livestock improvement. A "Young Bull Society" has been formed under the auspices of the club, and members are purchasing pedigree bull calves, which are to be brought along for twelve months or so and then shown in competition and offered for sale. It is believed that the scheme will aid largely in the elimination of the "scrub" bull, and will raise the standard of live stock along the countryside.

TO WHEATGROWERS.

The demand for Departmental Wheats for this season's sowing has been so heavy that practically the only seed now available for distribution at the Roma State Farm is of the "Watchman" variety.

"Duke of York" seed is still available at the Chief Office of the Department, William street, Brisbane.

Atherton Maize Board.

The successful candidates in the recent Atherton Tableland Maize Board election were:—

Harold Henry Collins, Atherton;
Lyall Reginald Crouch, Atherton;
John Gargan, Atherton;
William Bailey, Atherton;
Richard Ernest Moss, Tolga.

Messrs. Collins, Crouch, and Bailey were members of the old Board.

There were twelve candidates. The new Board will hold office for a term of one year as from the 1st April, 1930.

The Royal Society of Queensland.

The Annual Meeting of the Society was held in the Geology Lecture Theatre of the University at 8 p.m. on Monday, 31st March, 1930. The President, Professor J. P. Lowson, occupied the chair, and about sixty members and visitors were present. The Annual Report and Balance-sheet were adopted.

The following officers were elected for 1930:—President, Mr. J. B. Henderson, F.I.C.; Vice-Presidents, Prof. J. P. Lowson, M.A., M.D. (*ex officio*) and Dr. D. A. Herbert; Hon. Secretary, Mr. F. A. Perkins, B.Sc. Agr.; Hon. Librarian, Mr. W. D. Francis; Hon. Treasurer, Mr. E. W. Bick; Hon. Editors, Mr. H. A. Longman, F.L.S., C.M.Z.S., and Dr. W. H. Bryan, M.C.; Hon. Auditor, Prof. H. J. Priestley, M.A.; Members of Council, Dr. R. W. Cilento, Dr. T. G. H. Jones, Mr. J. A. Just, M.I.M.E., Prof. H. C. Richards, D.Sc., and Mr. C. T. White.

The following were proposed for ordinary membership:—Mr. A. J. Stoney, B.E.E., proposed by Dr. Herbert and Mr. Perkins; Dr. J. M. Roe, proposed by Mr. Buhot and Mr. Perkins; Mr. E. M. Shepherd, B.E., proposed by Mr. E. J. Wood and Mr. Perkins. Messrs. D. O. Atherton and H. K. Lewcock, M.Sc., were unanimously elected ordinary members of the Society.

The President moved and Prof. Richards seconded the following motion, which was carried unanimously:—"That a message be sent to Sir Douglas Mawson, Capt. Davis, Prof. Harvey Johnston, and the rest of their party congratulating them on their safe return and the wonderful work achieved."

Prof. J. P. Lowson delivered his Presidential Address, entitled "Recent Psychology." On the motion of Prof. Goddard, seconded by Prof. Scott Fletcher, a vote of thanks was accorded the retiring President for his address. Prof. H. C. Richards and Mr. H. Longman expressed the Society's appreciation of the presence of His Excellency the Governor.

The Minister for Agriculture.

Thus the "Queensland Producer" of 2nd April:—

"This journal has at various times in the past, particularly when Mr. Walker was in opposition, deemed it desirable to call in question certain actions of Mr. Walker. We reserve to ourselves the right to express opinions with respect to the attitude of any public man in relation to agricultural organisation. We feel bound to say, however, that since Mr. Walker became Minister for Agriculture he has certainly made good. He has gone out of his way to get down to bedrock as to what the producers' problems really are. He has made himself most approachable and has been prepared to listen to suggestions and also to statements by producers' representatives of their difficulties, and he has done so with the utmost patience and consideration. Mr. Walker has been working very long hours and has certainly devoted himself to the cause of the farmers of Queensland.

"He has also taken a very big view of the possibilities of the development of Queensland agriculture, and his Wheat Agreement Scheme, designed to bring about increased production of wheat, was a masterpiece, and brought about harmony between the Wheat Board and the millers where formerly there was discontent and continual strife. His attitude in establishing the Banana Industry Protection Board was a big move. His broadminded action in collaborating with the Hon. F. M. Forde in a big forward step to develop the cotton industry is typical of the way in which Mr. Walker sheds the political aspects for wider national point of view."

Native Birds—Variation of Open Season.

Orders in Council have been issued under "*The Animals and Birds Acts,* 1921 *to* 1924," providing for a variation of the open season for certain native birds in Queensland. For this purpose the State has been divided into three districts, instead of two as hitherto. The Southern District (No. 1) comprises the pastoral districts of Moreton, Darling Downs, Wide Bay, Burnett, Maranoa, Warrego, Gregory South, and that portion of Leichhardt south of the 25th parallel of south latitude. The Central District (No. 2) consists of the pastoral districts of Port Curtis, South Kennedy, and Gregory North, that portion of Leichhardt north of the 25th parallel of south latitude, and that portion of Mitchell south of the 22nd parallel of south latitude. The Northern District (No. 3) comprises the pastoral districts of Cook, Burke, and North Kennedy, and that portion of Mitchell north of the 22nd parallel of south latitude.

In pursuance of an Order in Council issued on 27th March, the open season will extend from the 1st May to the 30th September in the Southern District, from the 1st July to the 30th November in the Central District, and from the 1st June to the 31st October in the Northern District, in respect of the following birds:—

Brush or Scrub Turkey;
Budgerigah or Shell Parrot;
Bustard or Plain Turkey;
Bald Coot, Swamp-hen, or Redbill;
Black Moor-hen or Water-hen;
Cockatoo Parrot or Quarrion;
Dotterel, all species excepting Sand Dotterels;
Emu;
Goose and Duck, all species excluding Black Swan;
King Parrot;
Long-billed Cockatoo or Corella;
Lorikeets or Honey Parrots;
Native Hen;
Pigeon and Dove, all wild species except "Squatter," "Whampoo," and "Nutmeg";
Plover, all species excepting Golden Plover;
Quail, all species;
Redwing Parrot;
Ring-neck Parrot;
True Coot.

Sportsmen in Southern Queensland are specially requested to note that the variation involves the postponement of the opening of the season for the birds mentioned, until the 1st May next.

No variation has been made in respect of those native birds or animals which are totally protected throughout the State.

The Master Stockman.

With glad acclaim and bearing garlands bright and wreaths of bay
We sing the glories of the fecund fields where herdsmen-shepherds hold their gentle sway!
In pastures green, by running brooks; in bosky dells, in grassy nooks,
The distant mellow jangling of sweet bells proclaims the peaceful paths
Of lowing herds and fleecy flocks, the gifts supreme of husbandry.

Blessed be the land on which they graze! And blessed those who guide them on their ways!
Wielders of power that verges on the infinite itself!
Dreamers of dreams who live to see their dreams come true!
Workers of miracles in a world that's all their own!
Keepers of keys to life's most hidden mysteries!
Let kings and lords of lesser human realms make way!
While all the nations from the depths of grateful hearts
Unite to crown the master stockman master of the art of arts!

—A.H.S., in "The New Breeder's Gazette," Chicago.

Chinchilla Rabbit Skin Values.

An extract from Bulletin No. 5, Department of Industries and Commerce, New Zealand, containing a summary of the finance, trade, and industries of the Dominion for the quarter and year ended 31st December last, has been brought under the notice of the Minister for Agriculture and Stock (Mr. H. F. Walker).

In this summary it is noted that the prices of Chinchilla rabbit skins have fallen to a considerable extent, together with the prices of other furs. At a sale in London during the period under review, when only 18,000 skins were sold out of 40,000 offered by the Hudson's Bay Company, prices realised for the quantity sold were as follows:—

Firsts	1s. 5d. to 3s. each.
Seconds	6d. to 1s. 6d. each.
Thirds	6d. to 9d. each.

The Mininster drew attention to the fact that this confirmed information recently supplied to him by the Agent-General in London, and which has already appeared in the Press.

Larry.

(To the late Larry Doyle, Stock Inspector, a man among men.)

The outback tracks where the mobs go through,
Where spinifex wither and spoil;
The dusty plains where gidyeas grew,
Were friends of Larry Doyle,
Where a man's size job is done each day,
And the law of the plain is old;
Not every man, as Doyle, could say,
"Honour was dearer than gold."

Though death came quick in his splendid year,
And we are poor with his loss;
Many a man will stay a tear,
Where a mother bears her cross.
"They oft die young, the Gods must take,"
E'er life has fashioned her coil,
But Oh, we are proud for the outback's sake,
There are men, "Real men like Doyle."

—James M Matheson, Mount Isa, in the "Cloncurry News."

The late Mr. Lawrence P. Doyle, Inspector of Stock at Mount Isa, in the far nor'-west of the State, was accidentally drowned in flood waters while attempting to cross Lagoon Creek, near Mount Isa, on 4th February last. He was a promising and valued officer of this Department. —Ed.

The Farmer's Intelligence.

Although the world's oldest industry, the cultivation of the land is even now treated with indifference by a section of the public, which—forgetful of the fact that without the farmer it could not exist—regards the tiller of the soil as an inferior being, deficient in all those qualities of business, thrift, and application of which it believes itself to be the sole possessor. That this was not always the case is clear from the works of some of the greatest writers of ancient times, all of whom gave to agriculture the first place among the professions of man.

Virgil, one of the greatest poets of all time, regarded the art of husbandry as of so much importance as to devote the best of all his wonderful poems to the description of its various branches; Ovid extolled the joys of country life, and the Greek historian Herodotus has left records that tell the methods employed by the ancient Egyptians in rendering their country the granary of the world.

These writers gave to the farmer the credit of being the possessor of more than average intelligence and skill, qualities without which the modern agriculturist would long ago have failed to hold his own in the markets of the world.—"Live Stock Journal" (England).

Czech Women and Farming.

"Back to the land" has been a slogan in various countries for many years, but nowhere has this cry been heard with such enthusiasm that it has become a national creed as in the prosperous Bohemian Republic of Czechoslovakia, which came into existence after the World War, when the Austrian Empire was split up into small independent States. Men and women, young and old, are trained to take its cultivation seriously. In towns and countryside schools have opened where women as well as men may acquire practical knowledge in everything which pertains to farming. No woman shirks this training, whether she is the daughter of a farmer or a millionaire. All workers on the land are encouraged to spend their spare time in making not only beautiful embroideries, but glass objects, furniture, kitchen utensils, and pottery. Ten thousand crowns are given away every year in prizes. The rural population in Czechoslovakia has preserved the artistic traditions of their forefathers, and peasants, especially of old Bohemia, have preserved and developed the art which made them famous in the past.

Scientific Literature—A Commonwealth Catalogue.

Workers in all branches of science, in agriculture, in medicine, in the technical and other fields are always handicapped by the difficulties of obtaining the literature necessary for their work. It is manifestly impossible for the private worker to accumulate for himself a library adequate to his needs. The worker in departments or institutions, although in a better position, has constant need to refer to libraries other than his own in order to be able to keep abreast with the literature in his subject.

In Australia, investigators are particularly handicapped by difficulties inevitable in a country where technical libraries are relatively few and distances between them often very great. While these disabilities cannot be completely remedied, they can be considerably reduced by making readily available a catalogue of the contents of these libraries. A publication of this description enables the worker to locate without waste of time the literature that he requires.

Insofar as periodicals are concerned, and it is periodicals that are of paramount importance to the average worker, a catalogue designed to serve this purpose has now been published by the Commonwealth Council for Scientific and Industrial Research. This catalogue, which has been prepared under the editorship of Mr. E. R. Pitt of the Melbourne Public Library, includes periodicals (in all languages) of a scientific and technical nature and also the publications issued serially by Government departments, institutions, and societies in all countries. In all, 132 Australian libraries have been catalogued. Included in these are the public libraries, the parliamentary libraries, and the libraries of Government departments, of the universities, the scientific societies, and institutions in each State.

A copy of this catalogue will be found invaluable not only on the shelves of all libraries but also to medical men, technical chemists, engineers, architects, veterinarians, and those engaged in agricultural research, in public health and sanitation matters, and to all classes of builders and manufacturers. Throughout the preparation of the catalogue special attention has been paid to Australian publications, and it will therefore serve as a record of all periodicals of a scientific and technical nature that have been published in Australia.

Neglect of Farm Implements.

The formation of a society for the prevention of neglect of farm implements was suggested by Mr. Hugh B. McFadzean, in the course of an address which he gave to the members of the Glasgow and West of Scotland Agricultural Discussion Society on the subject of "The Care of Farm Implements." Mr. McFadzean advocated "houses for implements," so as to prevent weather decay when the implements were not in use. Another essential was the periodical application of good quality paint, which alone could combat the destructive power of corrosion, especially of steel work. In conclusion, he said that the farmer in these days required to use modern machinery, and to keep it in first-class condition. All implements should be carefully overhauled, cleaned, and oiled before being brought into use.

On Buying a Herd.

It is of great importance that every animal destined to be kept in the herd for breeding purposes should have passed the tuberculin test, and whilst it sometimes has happened that an animal has passed the test on one occasion and reacted on another, an owner should, so far as possible, endeavour to make sure on the point ere using such animal, be it male or female, for breeding purposes.

Every breed of cattle possesses its own distinctive features, and although such may be more or less subdivided, there nevertheless is, broadly speaking, a distinctiveness in type in every breed which is as near the ideal as has yet been reached, and at which every breeder should at least aim as his objective.

Whilst in some ways it is an advantage to commence with a young bull and some heifers, there is, on the other hand, a good deal to be said in favour of trying to get hold of a bull which has already done good work in a herd, and also of some cows which likewise have proved their worth as breeders. Having acquired the nucleus of a herd, it is up to the owner to keep in mind the particular type of animal he favours, and to endeavour, so far as possible, not only to stick to such type, but to try and improve on it.—WINDYCUSS, in the "Live Stock Journal" (England).

Decrease in Swine Fever (also called Hog Cholera) in the United States of America.

Hog cholera is less prevalent and has resulted in fewer losses during 1929 than ever before in the history of records by the United States Department of Agriculture, according to Dr. U. G. Houck, associate chief of the Bureau of Animal Husbandry, who has just released a summary of information assembled from thirty-one States.

In only four States—Indiana, Michigan, Nebraska, and Ohio—is hog cholera more prevalent than last year, the lowest loss period up to the current year, Dr. Houck's report shows. Little change in the situation this year is announced for Colorado, Kentucky, North Carolina, Texas, Illinois, Tenessee, Mississippi, and Wisconsin. Less cholera prevails in Alabama, California, Georgia, Kansas, Maryland, Oklahoma, West Virginia, Arkansas, Iowa, Florida, Idaho, Louisiana, Missouri, South Carolina, Utah, Oregon, South Dakota, Virginia, and Washington.

Though the improvement in all but three States is slight, Oklahoma reports a reduction of 50 per cent., Louisiana 40 per cent., and Idaho 30 per cent.

"The hog situation in general," Dr. Houck said, "seems to be somewhat better than last year. According to our information there has been a considerable increase this year over last year in the amount of immunisation against hog cholera in fifteen of the thirty-one States. There was an appreciable difference in nine States, and seven States report less immunisation than last year."

Dr. Houck spoke of the report from Idaho stating that most of the swine fever of recent months occurred on farms where unimmunised animals had been purchased at public sale grounds. A mid-western veterinarian explained that occasional "breaks" of the serum usually happened when "too little attention is given to the condition of the herd immediately prior to immunisation," the result of giving virus to animals not in fit condition to receive it. In such cases losses often were severe.

Dr. Houck quoted the report of a Nebraska swine observer to the effect that vendors of swine remedies had become increasingly prevalent during the past few years in that State, and that in many cases such agents had caused owners of sick herds to put off securing competent veterinary assistance until too late to save their pigs. In other cases the remedies sold by the agents had actually caused illness. The same observer recommended use of the McLean county system of sanitation approved by the Department of Agriculture, feeding of balanced rations, and employment of a competent veterinarian when disease appeared in the herd.

The Citrus Crop—Harvesting Hints.

The harvesting of early varieties of citrus fruits in early districts will commence in May, and growers would be well advised to have everything in readiness for handling the frut. The picking boxes should be thoroughly overhauled and cleaned and any loose boards on the cases should be securely fastened and protruding nails removed. To secure the best results, it is necessary to keep the skin of the orange in a sound condition—free from abrasions and punctures.

When sizing machines are used, they should be thoroughly examined and any necessary adjustments made. The advent of the sizing machine has done much to assist the grower, and those who have not yet installed a sizing machine in their packing shed should do so without delay. Hand sizing is a slow, costly, and inaccurate way of carrying out the work. Sizing by machines is much more economical.

Noogoora Burr Poisonous for Stock.

Recent experimental work undertaken at Glenfield Veterinary Research Station for the Poison Plants Committee of the Council for Scientific and Industrial Research has demonstrated that Noogoora burr plants are poisonous for stock, but only at an extremely early stage of growth.

The plant as it comes through the ground shows two primary leaves or cotyledons. Their appearance is followed by the development of a stalk and the usual leaf growth. The only stage found to be poisonous has been the cotyledonary stage, and that stage when the plant shows only two leaves and still has the cotyledons attached. The cotyledons soon wither away, and the plants tested after they have disappeared have not been found to be harmful.

Pigs are most susceptible, calves coming next. Sheep may also be poisoned, but are not so susceptible as either calves or pigs.

"Bloom."

Looking at the question of bloom from the showyard standard, a person is occasionally pulled up by someone who asks, "Are judges not generally inclined to lay undue stress on bloom or finish for the time being? Do they always take sufficient account of breeding, character, and the main run of properties which are greater debtors to blood and Nature than to the hands of trainers?" A plain "Yes" or "No" is not enough of a reply to such queries as these. Just as in the showyard itself, one must not be hustled round the subject. A qualified negative to the first and a less qualified affirmative to the second are fair sets-off.

A capable judge will not lose sight of breeding or character. He may go slightly out of his way—in the case of young female animals, for instance—to show his appreciation of discreet feeding; but why should anyone expect him to be generous to the owner of any animal which carries dirt or poverty, or a combination of both, into the ring?—"Live Stock Journal" (England).

Right Type of Pig—American Method of Educating Farmers

With the object of impressing upon pig raisers the necessity of producing a type of pig that is in favour packers in the Middle West of the United States recently exhibited a carload of pigs at the leading shows of the type and finish that best meet their demands.

These pigs weighed about 200 lb. and carried a medium finish, that is to say, the fat on their backs would probably be from 1½ to 2½ inches in depth with a smooth covering of fat over the shoulders, sides, and hams. The pigs showed excellent quality, as was shown by the smoothness in body and conformation, with hair that was smooth and not curly. The bone was of medium size and of good quality.

With a balance between the shoulders and hams, with no falling away along the sides, these pigs had sides that were smooth and fairly deep, with considerable widths of back and loin, although the backs and loins were not so wide as the backs and loins of pigs that were common fifteen years ago. They were rather longer pigs, however, and the jowls were not heavy.

Pig raisers were advised that in order to produce pigs of this kind when finished it would probably be best to begin with a pig that was smooth, of good quality, and having considerable length, with enough depth and width to have a well-balanced pig when at a marketable weight.

The Duroc-Jersey Pig.

In a recent communication from the American Duroc Association, the well-known American "Red" pig, the Duroc-Jersey, is spoken of in highly appreciative terms as—

"The Duroc, the world's supreme hog."

"The breed that has stood every test and proven superior in Pork Production."

"The breed that outweighs other breeds at every age."

In the 1927 National Swine Show, the Duroc winners in every class outweighed their competitors of other breeds. The average weight of the 80 head winning in all ten classes was 38.2 lb. heavier than their nearest competitor and 176.6 lb. heavier than the lightest breed shown. In the 1928 National Show, the Grand Champion boar was a junior yearling weighing 862 lb., the heaviest junior ever shown at a world's Show.

Win in Feeding Contests.—A Pig Club boy won grand champion in the International Junior Feeding Contest for 1928 with a Duroc barrow. In the California Live Stock and Baby Beef Show in 1928, a Pig Club boy won grand champion with a Duroc barrow.

Win in Ton Litter and Herd Contests.—More Duroc litters have won in Ton Litter State Contests than litters of any other breed. The record of 4,925 lb. in 180 days from a Duroc litter, challenges the world.

In the Colorado State Herd Production Contest in 1928, Duroc herds took first, second, and third prizes. The first prize herd sows each produced 1,889.3 lb. of pork in one litter, one litter reaching 2,592 lb.

THE JOURNAL APPRECIATED.

A Geebung farmer writes (3rd April, 1930):—"I very much appreciate the Journal and have taken it for years. I have also recommended it to other farmers round about my former home at Proserpine. Since coming south to live I have continued that practical advocacy of its usefulness to the man on the land."

Butter Equivalents in Milk and Cream.

The amount of milk required to produce 1 lb. of butter depends upon the fat content of the milk. The butter-fat content of milk varies, the average test being 3.8 per cent. Since .85 lb. of milk fat is sufficient to make 1 lb. of butter it will require approximately 22.4 lb. of milk of a 3.8 per cent. fat to produce .85 lb. of milk fat or its equivalent, 1 lb. butter.

The following indicates the varying amounts required according to the test of the milk:—

25.8 lb. milk testing 3.3 per cent. fat will make 1 lb. butter.
23.7 lb. milk testing 3.6 per cent. fat will make 1 lb. butter.
22.4 lb. milk testing 3.8 per cent. fat will make 1 lb. butter.
21.8 lb. milk testing 3.9 per cent. fat will make 1 lb. butter.

The amount of cream required to make 1 lb. of butter depends upon the fat content of the cream produced in the process of separation.

The cream screw of the separator bowl can be regulated to produce a cream of a desired fat content.

"*The Dairy Produce Act of* 1920" provides that cream delivered to a butter factory during the period April to September, inclusive, shall contain not less than 34 per centum of fat, and that delivered during the period October to March, inclusive, shall contain not less than 38 per centum of fat.

The following indicates the varying amount of cream required according to the test of the cream:—

2.5 lb. cream testing 34 per cent. fat will make 1 lb. butter.
2.24 lb. cream testing 38 per cent. fat will make 1 lb. butter.
2.12 lb. cream testing 40 per cent. fat will make 1 lb. butter.

In Favour of Berkshires.

Writing in his usual informative style, Mr. Norman Williams, a prominent and successful breeder of Berkshire pigs at Wilmot, Tasmania, states that in his opinion we have, in Australia, some of the finest stud pigs in the world, pigs of a quality that would compare with the best in any country, and equally productive, although we could do with further introductions of fresh blood with which to build up and strengthen existing and fresh studs. He states he has recently purchased from Mr. Luke Williams, of Moonah, Tasmania, the winner of the Berkshire Societies' Cup (British), Plumpton Prince, a Berkshire boar of high quality and modern type. He also secured Tarooma Marquis, a champion stud boar; this boar is producing the best pigs Mr. Williams ever bred, fine shoulders, great quality, and perfect type. He sired the winning boar under nine months at Melbourne Show. This boar has sired as many as eight show pigs in one litter from well-bred, good quality pigs.

Moisture in Butter.

Shrinkage occurs when butter is held in storage for several weeks or longer, and is due to loss of water content, chiefly by evaporation. The shrinkage due to evaporation of moisture is influenced by the distribution of the moisture content of the butter. Uniform distribution of the water in the butter is obtained by giving the butter the correct amount of working. When the water is not thoroughly mixed with the fat the loss through leakage and evaporation is increased. When the moisture and fat are so thoroughly worked together that the moisture droplets are finely divided and thoroughly encased in fat the shrinkage is decreased. The object in working butter is to control and evenly distribute the moisture and to prevent mottles and streakiness in butter to which salt has been added. Butter manufactured under modern dairy factory conditions will be firm enough in body to allow of its being sufficiently worked to incorporate the moisture without injury to the body, texture, and general character of a first-grade product.

Pigs and Poetry Appeal to Him.

Thus the "Livestock Bulletin" (Sydney):—

No one would suspect that under the strictly utilitarian exterior of Mr. E. J. Shelton, Queensland's senior instructor in pig raising, lies a soul for poetry. Give Mr. Shelton but half a chance, and he will pour into one's ear a glowing account of some sow that has done her duty nobly by raising a litter of seventeen and doing them well. He will talk of ton litters and Durocs, and tuberculosis of the throat, and paralysis, and of all the little parasites that infest the intestines of pigs, both large and small, but one will not hear a word of poetry from him.

When he writes to us, however, he generally slips into the envelope a verse or two, neatly typed out, that has appealed to him, and never are these verses about pigs. Here is one that came a day or two ago:—

"To every man there openeth
  A Way, and Ways, and a Way,
And the high soul climbs the High Way,
  And the low soul gropes the Low;
And in between, on the misty flats,
  The rest drift to and fro;
But to every man there openeth,
  A High Way and a Low,
And every man decideth
  The Way his soul shall go."

—John Oxenham.

It seemed to us as we read that verse that it put into words Mr. Shelton's philosophy, and the philosophy of every man who tries to leave a herd, or a farm, or a flock, better than he found it. The man who sets himself to build a herd that will average 400 lb. fat a year, or a herd of pigs that will make a large and steady gain, is the man who climbs the High Way. The man who says that "dairyin' don't pay no how" gropes along the Low Way.

Mr. Shelton, eager to learn what the other side of the world is doing to make pig raising more profitable, is off to England shortly. Everyone who knows the enthusiastic fellow will wish him well on his adventure. He has decided which way his soul shall go.

Watering the Horse.—Dangers of Impurity.

Horses require anything from 5 to 15 gallons of water a day, the quantity depending on the temperature and the amount of work performed. The water should be as pure as possible, clear in appearance, and free from taste, colour, or smell. Pure water is just as essential to a horse as it is to a man, and it is a mistake to suppose that a horse can drink badly contaminated water with impunity. Water obtained from pools or shallow wells, contaminated with surface drainage, or containing decomposing organic matter, frequently causes diarrhœa, and generally predisposes to colic. Water that contains a large amount of sediment should not be given, as the sediment causes a mechanical irritation of the mucous membrane of the stomach and intestines—i.e., sand colic. When at rest in the stable, water should be given three times a day, and should invariably be given previous to feeding.

This latter point is of considerable practical importance. A horse's stomach is small in proportion to the animal's size, and water does not remain in it, but passes through the stomach and small bowel to the cæcum, or water-gut. If water is given after feeding, besides weakening the digestive juices, a considerable portion of the food in the stomach and small intestines will be washed out in an undigested state, and indigestion and colic may result. Water in small quantities can be given within an hour or so from the completion of feeding, if desired.

After a long journey, a good plan is to water a mile or so before the journey's end, and take the horse slowly in afterwards. This prevents chills and colic, due to the ingestion of a large quantity of water when in an exhausted state. An animal after prolonged exertion or fast work has his system depleted of fluid. He will not eat sufficiently until his thirst has been satisfied; therefore the water should come first, and while the animal is still warm is the best time to give it. After standing, the body temperature falls, and to give cold water freely then is only to intensify the effect of the cold water on the system.

The Australian Soldier—The Man that He Was.

A flood of war "literature" has been let loose on the reading public of the Old Country by malicious and commercial-minded "base-wallahs" who evidently stick at nothing in their exploitation of all kinds of filth and nastiness; and also in their efforts to slander the Australian soldier. What sort of man was the Digger, anyhow? This is how Captain Bean viewed the young countryman of the Commonwealth in "The Official History of Australia in the War of 1914-18":—

All through the war the light horseman tried things by the light of his strong common sense. On a hard-riding advance, when victory depended upon speed, and speed upon a supply of horse-feed, he did not hesitate to help himself to any grain or other fodder possessed by the natives of the country. Orders forbidding such conduct might have been couched in the strongest terms; but when it was a choice between failure through loss of horses, and success to be achieved by the commandeering of fodder, he did not hesitate to flout authority. He dismissed such incidents from his mind with the scornful thought that a General Staff which could not settle trifling affairs of that sort with the natives was not fit for its job, and rode on happy because the bulging nosebag ensured an evening meal for his beloved waler.

The light horseman, with all his unconventional ways and his occasional forcefulness, was at heart distinguished by shyness and reserve. The young Australian countryman leads a simple and peaceful life. He bears himself modestly. One of the first horsemen of the world, and breeding the world's best horses of their kind, he indulges himself in no distinctive horseman's attire. He has none of that picturesque flashness which cowboys of Western America and the Canadian North-west of a generation ago inherited from the Spanish pioneers of the Pacific slope. A felt slouch hat, a shirt with the sleeves rolled to the elbows, long trousers not particularly made for riding, boots, and very gentle spurs make up his everyday dress. He rides, as a rule, in a plain English hunting saddle, and carries neither lasso nor revolver. A temperate man, his one excess is a harmless celebration at the annual races or agricultural show, or on an occasional visit to the capital city of his State; even then the impelling force is the bursting strength of his youth rather than any disposition for strong drink or unwholesome excitement. Men of all young English countries engage in these occasional sprees, which were in fact a stronger feature of the early pioneering days, when most of the settlers were of British birth, than they are among the native-born. The young countryman of the Commonwealth is neither a hard nor a regular drinker, but, when his rare holiday comes, he engages whole-heartedly in a joyous demonstration. On occasion he did this at Cairo, and at other places abroad, and his high spirits and forceful, but

as a rule quite harmless, carnivals sometimes led to misunderstanding in the minds of men who did not know the native wholesomeness of his life at home. Any study of the slender "crime" sheets of the light horseman throws a sure light upon his character. The worst offence discoverable there (with the exceptions inevitable in a body of many thousands of men) is that of occasional physical violence, of blows struck in anger. But those tell-tale sheets are clean of all morbid or unmanly offences, and remarkably free from charges of desertion, cowardice, or disobedience to orders in action.

Pigs for Export—Types Required for British Pork Market.

Although Australia does not export pork to Great Britain, it would appear that the present is an opportune time for experiments in this direction, provided the right type of pig is available to meet the demand of the public. Apparently the British farmers have not been able to fill the requirements, as loins of pork are being placed on the market from the United States.

Mr. S. Pulham, one of the leading London butchers, who frequently addresses farmers' meetings upon the needs of the markets, speaking at Guildford (England) recently, said that the crosses he favoured were the Large White and the Middle White and the Large White and the Berkshire. Above all (he said), the demand was lean meat and a wide and thick loin, and for the London trade a pig was required that weighed 80 lb. Irish farmers had not been so lax as English in the production of pork. When the embargo was put on, some enthusiastic salesmen at Smithfield went to Holland, and obtained Dutch slaughtermen and feeders and took them to Ireland, and during the last three years they had produced a large percentage of the pigs sold at Smithfield. Farmers would rather have a uniform price year in and year out, and if they could produce pigs profitably at 9d. or 10d. per lb. the butchers could make a reasonable profit out of it.

Preventing Sterility in Pigs.

Sterility in pigs is difficult to cure, but most forms of it can be prevented by proper management, says a contemporary, and the following points are important:—

(1) Fertility is heritable, therefore always select breeding stock from large litters.

(2) Breeding sows must have more protein and calcium than fattening stock in order to build up flesh and bone in their young. The important sources of supply of these are meat and protein meal, milk, and leguminous pastures.

(3) Exercise is essential for regular production.

(4) Show condition sometimes causes sterility, but this is when the pigs are over-fat and lack exercise.

(5) Exposure in winter will delay breeding.

(6) Contagious abortion is spread through infected afterbirth, dead piglings, and discharge contaminating the food, water, and bedding.

(7) The sow which has aborted is a danger to the herd, and should be separated and fattened.

(8) A common disease causing sterility is septic inflammation of the uterus. This usually causes a slight dirty white discharge. It is waste of time to try and treat such cases.

Co-operative Buying—Profitable Enterprise of Taree Farmers.

Discussing at a recent gathering at Dungog the subject of co-operative buying of farm requirements, the president of the Central North Coast Branches of the Agricultural Bureau of New South Wales deprecated the old principle of "take what I give you for what you sell, and pay what I ask you for what you have to buy," observing that in view of the decreasing margin of profit it was more than ever advisable for the farmer to consider the advantages of the pool system of buying. Farmers realised that they bought too dearly and sold too cheaply, said the speaker, but they seemed unready to accept new methods of selling and to be content to continue to buy in the old way small quantities from the middleman. Interesting details were given of the operations of the Taree Sub-district Council of the Bureau, which was registered as a trading society under the Act.

Although the society had come into existence at a bad time, said Mr. Richardson, just after the floods of February, 1929, there was a turnover of £600 during the first six months. Maize at that time was costing 24s. 6d. a bag locally, but when the society's supplies came forward from Queensland it was possible to sell

for 18s. a bag. The opposition then brought down their price to 17s. 9d. for ten-bag lots, and the society responded by quoting at the same figure for single bags. Fertiliser was sold at 9s. 6d., as compared with 12s. 6d. per bag in quantity locally; lucerne seed at 2s. as compared with 2s. 6d. The same advantage in prices applied to wheat and oats, but in the absence of a shed it was at first only possible to buy in truck lots, which had to be unloaded quickly to prevent charge for demurrage. At the suggestion of the local railway authorities, it was decided to build their own shed, one with a floor space of 24 by 16 feet being erected. In less than three months this had had to be doubled in size, and it had again been found too small.

During the six months ended December, 1929, the cash takings had been £4,800, and the following goods were handled:—1,200 bags maize; 600 bags chaff (sold at 7s. as against 10s. locally); 1,800 bags bran, pollard, and feed; 500 bags seed potatoes (from Crookwell, sold at a price which meant a saving of 7s. to 8s. per bag); 1,250 bags fertiliser. Six trucks of rice had also been bought as feed for pigs and poultry. Fencing wire was sold by the society at a price 4s. 6d. lower than down town, and though farming implements had to be sold at the manufacturers' price, the advantage came back to members in the form of bonus. Insurance was handled, and cream cans were also sold at a saving. When in due course the potato crop was harvested, the society handled the product for its members. When the price was down to £7 per ton in Sydney, £9 10s. had been obtained at Narrabri. There were local growers who were not satisfied with this; these, holding back, had had to accept £4 10s.

They were thus securing goods and selling them direct and cutting out the middleman, said Mr. Richardson. Their membership consisted only of actual farmers, and was constantly growing.

Congratulating the speaker on his address and Taree farmers on their enterprise, the Director of Agriculture (New South Wales), Mr. A. H. E. McDonald, said there was no doubt that the farmer was the loser by not looking after certain jobs himself.

The World's Live Stock.

Which country has the greatest number of live stock? According to the figures of the last complete year in all the countries for the purposes of comparison, there are 146,580,718 in British India, as against 67,835,000 in Russia, 55,681,000 in the United States of America, and 37,064,850 in the Argentine. In sheep Russia leads by 120,237,000, with 108,864,805 (Australia) second. Pigs are most plentiful in the United States with 60,200,000 (U.S.A.), Germany next with 22,800,318. The figures for Great Britain and Ireland are 12,230,042 cattle and 28,328,409 sheep.

Dingo Destruction,

The return of operations of Dingo Boards throughout the State for the year 1929 has now been made available to the Minister of Agriculture and Stock (Mr. H. F. Walker). Under existing legislation the eradication of the dingo and fox is undertaken by thirty-six boards, who make a levy on stockowners to meet estimated expenditure incurred in the payment of bonus for the destruction of these pests and for any administrative expenses.

Since the inception of legislation in 1877 dealing with dingo and marsupial destruction, approximately 1,040,000 dingo scalps have been paid for by boards, and the bonus payments have totalled about £1,200,000. Government assistance has been granted to the boards in the form of an endowment totalling over £350,000. During the year 1929 approximately 30,000 dingo scalps and 14,000 fox scalps were paid for.

The Minister, although pleased to call attention to the effective operations of the various boards, is concerned at the expenses of administration incurred. He is of opinion that in certain instances these expenses are out of all proportion to the volume of dingo destruction, but wishes it to be distinctly understood that this does not apply to every board in the State. It is noted that last year the administrative expenses of the boards totalled approximately £9,000. A case can be cited in one district where the expenses of administration reached a total of £1 9s. 8d. for each dingo scalp secured, and this excluded the bonus payment on the scalp of 15s. In the case of six other boards the administrative expenses, apart from the bonus payment, exceeded 10s. for each dingo scalp paid for.

Doubtless, the Minister added, this matter will be given serious consideration by the commission of inquiry which it is proposed to appoint to deal with the eradication of animal pests.

The Home and the Garden.

OUR BABIES.

Under this heading a series of short articles by the Medical and Nursing Staff of the Queensland Baby Clinics, dealing with the welfare and care of babies, has been planned in the hope of maintaining their health, increasing their happiness, and decreasing the number of avoidable cases of infant mortality.

OUR CHILDREN'S TEETH.

Primitive man has always had good teeth. He still has. The teeth of civilised man have not been so good. During the last century his teeth have been getting rapidly worse, and now in Australia we have the worst teeth that the world has ever seen. There has been nothing inevitable about this; it has all resulted from want of care based on want of knowledge. The condition of his teeth is civilised man's own fault, or the fault of his mother, or more rightly, I think, the fault of those who should have instructed the mothers how to look after their children's teeth.

Evils of Early Neglect.

For the most of the harm is done in infancy and childhood. As a people we expend a considerable sum of money on our teeth, but it is mostly spent much too late to obtain the best results. Nothing done in later life can fully repair the damage caused by neglect in these early years. We can easily see for ourselves how many young men and women have very visible gold-scarred teeth. If we could examine their back teeth, we should find that these were still worse, and many are even wearing plates with artificial dentures. Going still further back our Medical Inspectors have found that on entering school about six years of age only about one child in ten has teeth without defects, and many have very serious defects. We are, therefore, dealing with a national problem.

Children Should Never be Allowed to Suffer Toothache.

It must not be supposed that bad teeth are merely a local and unimportant trouble. Tooth-ache, from which children should never be allowed to suffer, is not the only result. Abscesses of the teeth, which are common among our children, may have serious effects on their general health. But the most serious consequences occur in later life, and comprise such a long list of chronic and crippling diseases that to enumerate them would be to write the headlines of a medical treatise dealing with the whole human body. Bad teeth and good health are, on a large scale, incompatible. A child with defective teeth is not getting the best start in life.

What Should be Done.

We must be brief, and lengthy explanations would be here out of place. Let us be severely practical, and give no more than a concise outline of what should be done, so simple that it can be understood by all parents, sufficiently broad to deal thoroughly with this great evil, and yet (at least for the most part) not beyond the power of most parents of intelligence and good will.

(1) At six years of age the trouble has, as a rule, already been there for one, two, or three years. Therefore, all mothers should carefully watch their children's teeth, and not forget all about them after they are two years old. Every child should have his teeth inspected by a dentist before he is four years old and once a year after that. Mothers should know that the first permanent teeth appear behind the milk teeth at six years of age. These are the most important teeth in the mouth; they are intended to last a lifetime, and often they are damaged at the very start. A skilful dentist will preserve them.

(2) At three years of age the child should be taught how to brush his teeth gently, as advised in the Queensland Mothers' Book. The object of brushing is to clean the teeth from particles of food. We do not advise the use of any tooth-paste or tooth-powder.

(3) The milk teeth are formed before birth, and depend on the health and food of the mother. This is a matter for ante-natal care. The permanent teeth are formed in the jaws during the first three years of life, and of these the first year is most important. Therefore every effort should be made to keep the baby on the breast so that he may have the best food possible. If, unfortunately, he has to be partly or wholly artificially fed the greatest care must be taken, and the mothers should always have skilled advice. This she may get at a Baby Clinic. A poorly nourished or sickly baby may attain good health in later years, but his permanent teeth may have been irretrievably spoilt.

(4) Mothers must learn that human teeth were made for hard biting, and without hard biting the child cannot grow strong teeth. At nine months old the baby should be taught to bite a finger of hard-baked bread. He soon learns to bite it, and not to try to swallow big lumps. Hard-baked bread is nicer and more digestible than soft bread and much better for children. It is a sad thing to see small children fed entirely with soft stuff, until at three years old some have such poor teeth that they cannot eat a crust.

(5) Most important is the way children are fed. Teeth decay because soft particles of bread, cake, biscuits, and such things lodge in and between the teeth and gradually destroy their hard covering. Consequently, children who are fed with these things between meals cannot have good teeth, for their teeth are never free from these particles. At their meals children should have a little fruit, raw or cooked, to finish up with, or some acid jam on their bread and butter, or lemon or other acid drinks. Children like all these things, and they excite a flow of saliva which washes away these food particles. Brushing the teeth after meals is also useful.

(6) All fruits contain sugar. Sugar in small quantities not only makes food nice, but is itself a valuable food. Chewing sticks of sugar-cane is one of the best ways of strengthening teeth. But we have formed the habit of giving concentrated sugar which forms a sticky deposit on the teeth and destroys them. Soft sweetmeats such as chocolate creams are the most destructive of all. Those silly people who give children sweets to please themselves, are not true friends of children.

Simple Rules Requiring Resolution in Observance.

These rules for strengthening and preserving children's teeth are really very simple. But the mother who tries to follow them will find many lions in her path. They are habit, custom, indifference, foolish traditions, silly sentimentalism, commercial enterprise, bold advertisements, shop window displays, bad example, and many more. To fight these will require some resolution.

WHITEWASH ON THE FARM—A USEFUL FORMULA.

Whitewash has a wide application to farm use, and deserves a much greater popularity than it at present enjoys. Its ingredients are inexpensive and readily obtained, it is not difficult to make, and it is easy to apply. In addition to these advantages it protects the surfaces to which it is applied, brightens up dark interiors, and is sanitary. Whitewash may be coloured, provided that light tints and shades are used and that the pigments are not affected by lime. Among such are yellow ochre, raw and burnt umber, and raw and burnt sienna.

The surface to be whitewashed should be just as clean as one that is to be painted, and it is a first essential to good results that all dirt, dust, grease, and scaly material be removed before there is any attempt to apply the wash. This implies a liberal use of scrapers and stiff brushes. When the cleaning is finished and the surface dusted, it is well to dampen it slightly just before applying the wash.

The following formula is recommended by the Supervising Architect of the New South Wales Department of Agriculture:—

Obtain, if possible, large pieces of fresh lump lime, place them in a very large bucket or other suitable container, and into this pour hot water. Cold water will do, but hot water is better as it hastens the slaking. The lime will start to boil and break up. Keep it covered all the time with about half an inch of water. This is important, for if whilst the lime is slaking it is allowed to rise up above the water in a dry powder it will "curdle," a condition tolerated only by inexperienced and indifferent workmen. Before the lime commences to boil fiercely, add tallow or common fat in the proportion of about 1 to 2 lb. to 7 lb. of lump lime. This makes a good binder which will prevent the wash from rubbing off. If desired, a little yellow ochre may also be added, which will give a cream or buff tint according to the quantity used. When the lime is thoroughly slaked it should be stirred and sufficient water added to make it a little heavier than, say, milk, after which it should be strained and, if desired, may be applied whilst hot.

KITCHEN GARDEN.

Cabbage, cauliflower, and lettuce may be planted out as they become large enough. Plant asparagus and rhubarb in well-prepared beds in rows. In planting rhubarb it will probably be found more profitable to buy the crowns than to grow them from seed, and the same remark applies to asparagus.

Sow cabbage, red cabbage, peas, lettuce, broad beans, carrots, radish, turnip, beet, leeks, and herbs of various kinds, such as sage, thyme, mint, &c. Eschalots, if ready, may be transplanted; and in cool districts horse radish can be set out.

The earlier sowings of all root crops should now be ready to thin out, if this has not been already attended to.

Keep down the weeds among the growing crops by a free use of the hoe and cultivator.

The weather is generally dry at this time of the year, so the more thorough the cultivation the better for the crops.

Tomatoes intended to be planted out when the weather gets warmer may be sown towards the end of the month in a frame where the young plants will be protected from frost.

A REMINDER TO ONION GROWERS.

Onion seed growers should, by this, have gone through their selected onions with the object of picking out the best keepers for the production of seed. The bulk of these onions should have been selected, previous to storing, for early maturity and variety characteristics. At the final selection bulbs that are soft or prematurely shooting, or those showing any indication of being bad keepers, or that are diseased, should be discarded.

The bulbs should be planted in rows at least 3 feet apart and spaced 2 feet apart in the rows. A handy position well protected from the boisterous winter winds should be selected for the growing of onion seed.

FLOWER GARDEN.

No time is now to be lost, for many kinds of plants need to be planted out early to have the opportunity of rooting and gathering strength in the cool, moist springtime to prepare them for the trial of heat they must endure later on. Do not put your labour on poor soil. Raise only the best varieties of plants in the garden; it costs no more to raise good varieties than poor ones. Prune closely all the hybrid perpetual roses; and tie up, without pruning, to trellis or stakes the climbing and tea-scented varieties, if not already done. These and other shrubs may still be planted. See where a new tree or shrub can be planted; get these in position; then they will give you abundance of spring bloom. Renovate and make lawns, and plant all kinds of edging. Finish all pruning. Divide the roots of chrysanthemums, perennial phlox, and all other hardy clumps; and cuttings of all the summer bedding plants may be propagated.

Sow first lots, in small quantities, of hardy and half-hardy annuals, biennials, and perennials, some of which are better raised in boxes and transplanted into the open ground. Many of this class can, however, be successfully raised in the open if the weather is favourable. Antirrhinum, carnation, picotees, dianthus, hollyhock, larkspur, pansy, petunia, *Phlox Drummondi*, stocks, wallflower and zinnias, &c., may be sown either in boxes or open beds. Mignonette is best sown where it is intended to remain. Dahlia roots may be taken up and placed in a shady situation out of doors, plant bulbs such as anemones, ranunculus, fresias, snowflakes, ixias, watsonias, iris, narcissus, daffodil, &c. The Queensland climate is not suitable for tulips.

To grow these plants successfully it is only necessary to thoroughly dig the ground over to a depth of not less than 12 inches, and incorporate with it a good dressing of well-decayed manure, which is most effectively done by a second digging; the surface should be raked over smoothly so as to remove all stones and clods, thus reducing it to a fine tilth. The seed can then be sown in lines or patches as desired, the greatest care being taken not to cover deeply; a covering of not more than three times the diameter of larger seeds, and a light sprinkling of fine soil over small seeds, being all that is necessary. A slight mulching of well-decayed manure and a watering with a fine-rosed can will complete the operation. If the weather prove favourable, the young seedlings will usually make their appearance in a week or ten days; thin out so as to leave the plants (if in the border) at least 4 to 6 inches apart.

Farm Notes for June.

FIELD.—Winter has set in, and frosts will already have been experienced in some of the more exposed districts of the Maranoa and Darling Downs. Hence insect pests will to a great extent cease from troubling, and weeds will also be no serious drawback to cultivation. Wheat sowing should now be in full swing, and in connection with this important operation should be emphasised the necessity of at all times treating seed wheat by means of fungicides prior to sowing. Full directions for ''pickling'' wheat by copper carbonate treatment are available on application to the Department of Agriculture, Brisbane. Land intended for the production of early summer crops may now receive its preliminary preparation, and every opportunity taken advantage of to conserve moisture in the form of rainfall where experienced; more particularly so where it is intended to plant potatoes or early maize. Where frosts are not to be feared the planting of potatoes may take place in mid-July; but August is the recognised month for this operation. Arrowroot will be nearly ready for digging, but we would not advise taking up the bulbs until the frosts of July have occurred. Take up sweet potatoes, yams, and ginger. Should there be a heavy crop, and consequently a glut in the market, sweet potatoes may be kept by storing them under cover and in a cool place in dry sand, taking care that they are thoroughly ripe before digging. The ripeness may be known by the milky juice of a broken tuber remaining white when dry. Should the juice turn dark, the potato is unripe, and will rot or dry up and shrivel in the sandpit. Before pitting, spread the tubers out in a dry barn, or in the open if the weather be fine. In pitting them or storing them in hills, lay them on a thick layer of sand; then pour dry sand over them till all the crevices are filled and a layer of sand is formed above them; then put down another layer of tubers, and repeat the process until the hill is of the requisite size, and finally cover with either straw or fresh hay. The sand excludes the air, and the potatoes will keep right through the winter. In tropical Queensland the bulk of the coffee crop should be off by the end of July. Yams may be unearthed. Sugar-cane cutting may be commenced. Keep the cultivator moving amongst the pineapples. Gather all ripe bananas.

Cotton crops are now fast approaching the final stage of harvesting. Growers are advised that all bales and bags should be legibly branded with the owners' initials. In this matter the consignor is usually most careless, causing much delay and trouble in identifying parcels, which are frequently received minus address labels.

Orchard Notes for June.

THE COASTAL DISTRICTS.

The remarks that have appeared in these notes for the past two months apply in a great measure to June as well, as the advice that has been given regarding the handling, grading, packing, and marketing of the citrus crop still holds good. As the weather gets cooler the losses due to the ravages of fruit flies decrease, as these insects cannot stand cold weather, and consequently there is only an odd one about. The absence of flies does not, however, permit of any relaxation in the care that must be taken with the fruit, even though there may be many less injured fruit, owing to the absence of fruit-fly puncture, as there is always a percentage of damaged fruit which is liable to speck, which must be picked out from all consignments before they are sent to the Southern States if a satisfactory return is to be expected. If the weather is dry, citrus orchards must be kept in a good state of tilth, otherwise the trees may get a setback. Old worn-out trees can be dug out and burnt; be sure, however, to see that they *are* worn out, as many an old and apparently useless tree can be brought round and made to bear good crops, provided the trunk and main roots are still sound, even though the top of the tree is more or less dead. The whole of the top of the tree should be cut off and only the trunk and such sound main limbs left as are required to make a new head. The earth should be taken away from around the collar of the tree, and the main roots exposed, any dead roots being cut away and removed. The whole of the tree above ground and the main roots should then be dressed with a strong lime sulphur wash or Bordeaux paste. The main roots should be exposed for some time, not opened up and filled in at once. Young orchards

can be set out now, provided the ground is in good order. Don't make the mistake of planting the trees in improperly prepared land—it is far better to wait till the land is ready, and you can rest assured it will pay to do so in the long run.

When planting, see that the centre of the hole is slightly higher than the sides, so that the roots, when spread out, will have a downward, not an upward, tendency; set the tree at as nearly as possible the same depth as it was when growing in the nursery, cut off all broken or bruised roots, and spread those that remain evenly, and cover them with fine top soil. If the land is dry the tree should then be given a good watering, and when the water has soaked in the hole can be filled up with dry soil. This is far better than watering the tree after the soil has been placed round it and the hole filled up. Custard apples will be ripening more slowly as the nights get colder. If the weather becomes unduly cold, or if immature fruit is sent South, the fruit is apt to turn black and be of no value. This can easily be overcome by subjecting the fruit to artificial heat, as is done in the case of bananas, during the cooler part of the year, when it will ripen up properly and develop its flavour. Grade custard apples carefully, and pack in cases holding a single layer of fruit only for the Southern markets.

Pineapples, when at all likely to be injured by frost, should be protected by a thin covering of bush hay or similar material. The plantation should be kept well worked and free from weeds, and slow-acting manure, such as bonedust or island phosphates, can be applied now. Lime can also be applied when necessary. The fruit takes longer to mature at this time of the year, consequently it can be allowed to remain on the plant till partly coloured before gathering for the Southern markets, or can be fully coloured for local use.

Banana plantations must be kept worked and free from weeds, especially if the weather is dry, as a severe check to the plants now means small fruit later on. Bananas should be allowed to become full before the fruit is cut, as they will carry all right at this time of the year; in fact, there is more danger of their being injured by cold when passing through New England by train than there is of their ripening up too quickly.

Bear in mind the advice given with regard to the handling, grading, and packing of the fruit. It will pay you to do so. Land intended for planting with bananas or pineapples during the spring should be got ready now.

Strawberries require constant attention, and, unless there is a regular and abundant rainfall, they should be watered regularly. In fact, in normal seasons an adequate supply of water is essential, as the plants soon suffer from dry weather or strong, cold westerly winds. Where not already done, vineyards should be cleaned up ready for pruning—it is, however, too early to prune or to plant out new vineyards.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

All kinds of deciduous fruit trees are now ready for pruning, and this is the principal work of the month in the orchards of the Granite Belt area. Don't be frightened to thin out young trees properly, or to cut back hard—many good trees are ruined by insufficient or bad pruning during the first three years. If you do not know how to prune, do not touch your trees, but get practical advice and instructions from one or other of the Departmental officers stationed in the district. In old orchards do not have too much bearing wood; cut out severely, especially in the case of peaches, or you are likely to get a quantity of small unsaleable fruit. There are far too many useless and unprofitable fruit trees in the Granite Belt area, which are nothing more or less than breeding-grounds for pests, such as fruit fly, and are a menace to the district. Now is the time to get rid of them. If such trees are old and worn out, take them out and burn them, but if they are still vigorous, cut all the tops off and work them over with better varieties in the coming season—apples by grafting in spring and peaches and other stone fruits by budding on to young growth in summer. Planting can start now, where the land is ready and the trees are to hand, as early planted trees become well established before spring, and thus get a good start. Be very careful what you plant. Stick to varieties of proved merit, and few at that, and give so-called novelties and inferior sorts a wide berth. Take the advice of old growers, and do not waste time experimenting with sorts that have probably been tested in the district and turned down years ago. When land is intended for planting this season, see that it is well prepared and well sweetened before the trees are put in, as young trees seldom make a good start when planted in sour and badly prepared land.

Slowly acting manures—such as bonedust, meatworks manure, or island phosphates—can be applied now, as they are not liable to be washed out of the soil, and they will be available for the use of the trees when they start growth in spring. Lime can also be applied where required. Badly drained land should be attended to, as no fruit trees will thrive with stagnant water lying round their roots.

On the Downs and Tableland all kinds of fruit trees can be pruned now, and vines can be pruned also in any district where there is no danger from late frosts, and where this can be done the prunings should be gathered and burnt, and the vineyard ploughed up and well worked to reduce the soil to a good state of tilth, so that should rain come it will absorb all that falls and the moisture can be kept in the soil by cultivation subsequently.

Citrus fruits will be at their best in the Western districts. The trees should be watered if they show signs of distress, otherwise all that is necessary is to keep the surface of the land well worked. All main-crop lemons should be cut by this time, as, if allowed to remain longer on the tree, they only become overgrown and are more suitable for the manufacture of peel, whereas if cut and cased now they will keep in good order so that they can be used during the hot weather.

QUEENSLAND SHOW DATES, 1930.

Mitchell: 7th and 8th May.
Mundubbera: 7th and 8th May.
Boonah: 7th and 8th May.
Murgon: 8th to 10th May.
Blackall: 13th to 15th May.
Roma: 13th and 14th May.
Goomeri: 14th and 15th May.
Gayndah: 14th and 15th May.
Wallumbilla: 20th and 21st May.
Ipswich: 20th to 23rd May.
Springsure: 21st and 22nd May.
Kilkivan. 21st and 22nd May.
Biggenden: 22nd and 23rd May.
Maryborough: 27th to 30th May.
Emerald: 28th and 29th May.
Toogoolawah: 30th and 31st May.
Marburg: 3rd June.
Childers: 3rd and 4th June.
Gin Gin: 5th to 7th June.
Bundaberg: 12th to 14th June.
Lowood: 13th and 14th June.
Miriam Vale: 16th and 17th June.
Gladstone: 18th and 19th June.
Mount Larcom: 20th and 21st June.
Rockhampton: 25th to 28th June.
Pine Rivers: 27th and 28th June.
Mackay: 1st to 3rd July.
Kilcoy: 3rd and 4th July.
Gatton: 9th and 10th July.
Woodford: 10th and 11th July.
Townsville: 8th to 10th July.
Cleveland: 12th July.
Barcaldine: 15th and 16th July.
Charters Towers: 16th and 17th July.
Caboolture: 17th and 18th July.
Rosewood: 18th and 19th July.
Ithaca: 19th July.
Laidley: 23rd and 24th July.
Nambour: 23rd and 24th July.
Esk: 25th and 26th July.
Ayr: 25th and 26th July.
Maleny: 30th and 31st July.
Royal National. 11th to 16th August.
Crow's Nest: 27th and 28th August.
Imbil: 3rd and 4th September.
Malanda: 5th and 6th September.
Gympie: 10th and 11th September.
Redcliffe: 12th and 13th September.
Beenleigh: 19th and 20th September.
Rocklea: 27th September.
Kenilworth: 27th September.

If you like this issue of the Journal, kindly bring it under the notice of a neighbour who is not already a subscriber. To the man on the land it is free. All that he is asked to do is to complete the Order Form on another page and send it to the Under Secretary, Department of Agriculture and Stock, together with a shilling postal note, or its value in postage stamps, to cover postage for twelve months.

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY D. EGLINTON, F.R.A.S., AND A. C. EGLINTON.

TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

	May, 1930.		June, 1930.		MOONRISE. May, 1930.	MOONRISE. June, 1930.
Date.	Rises.	Sets.	Rises.	Sets.	Rises.	Rises.
					a.m.	a.m.
1	6.21	5.17	6.39	5.2	8.33	10.29
2	6.21	5.17	6.39	5.2	9.36	11.19
3	6.22	5.16	6.40	5.2	10.40	11.59
						p.m.
4	6.22	5.16	6.40	5.1	11.41	12.36
					p.m.	
5	6.23	5.15	6.41	5.1	12.35	1.8
6	6.23	5.14	6.41	5.1	1.21	1.40
7	6.24	5.14	6.42	5.1	1.57	2.12
8	6.25	5.13	6.42	5.0	2.32	2.46
9	6.25	5.13	6.42	5.0	3.6	3 21
10	6.26	5.12	6.43	5.0	3.38	4.3
11	6.27	5.11	6.43	5.0	4.10	4.51
12	6.27	5.11	6.43	5.0	4.45	5.52
13	6.28	5.10	6.43	5.0	5.23	6.35
14	6.28	5.10	6.44	5.0	6.9	7.30
15	6.29	5.9	6.44	5.0	6.58	8.25
16	6.30	5.8	6.44	5.0	7.50	9.20
17	6.30	5.8	6.44	5.1	8.44	10.15
18	6.31	5.7	6.45	5.1	9.39	11.9
19	6.31	5.7	6.45	5.1	10.35	...
						a.m.
20	6.32	5.6	6.45	5.1	11.31	12.1
21	6.33	5.6	6.45	5.2	...	12.55
					a.m.	
22	6.33	5.5	6.46	5.2	12.11	1.47
23	6.34	5.5	6.46	5.2	1.18	2.51
24	6.35	5.4	6.46	5.2	2.12	3.56
25	6.35	5.4	6.46	5.3	3.8	5.1
26	6.36	5.3	6.46	5.3	4.6	6.9
27	6.36	5.3	6.47	5.3	5.8	7.16
28	6.37	5.2	6.47	5.3	6.16	8.17
29	6.38	5.2	6.47	5.3	7.22	9.13
30	6.38	5.1	6.47	5.3	8.29	9.55
31	6.39	5.1	...	...	9.32	...

Phases of the Moon, Occultations, &c.

6 May	☾	First Quarter	2 53 a.m.
13 ,,	○	Full Moon	3 29 a.m.
21 ,,	☽	Last Quarter	2 21 a.m.
28 ,,	●	New Moon	3 36 p.m.

Perigee, 5th May, at 4.48 a.m.
Apogee, 19th May, at 5.54 p.m.
Perigee, 31st May, at 3.36 p.m.

On the 13th the Moon will occult Delta Scorpii, magnitude 2·7. The times at which the star will disappear and reappear will depend upon the position of the observer and be earlier in the south than in the north of Queensland, generally speaking. The brightness of the full Moon will make telescope or binoculars necessary. Between extreme positions in the south-east and north-west observers should be ready to watch the Moon approaching the star from the west as much as three hours before midnight.

On the 16th the Moon will be passing above Saturn at a distance of 6 degrees, the length of the Southern Cross, about 2 a.m.; the position in the sky being about north-north-east.

Venus will be passing from west to east of Jupiter apparently at a distance of nearly three diameters of the Moon to the north. When visible they will be low down in the east-north-east, near daybreak.

On the 20th Mercury will be passing from the east to the west side of the Sun at a distance of rather more than the diameter of the Moon.

When the Moon passes Mars on the 25th at midday, they will be over in the north-west and may be visible with slight optical aid, if the eyes are well screened from the Sun.

Mercury will set at 6.17 p.m. on the 1st and on the 15th only 25 minutes after the Sun.

Venus will set at 6.28 p.m. on the 1st and at 6.41 p.m. on the 15th.

Mars will rise at 3.40 a.m. on the 1st and at 3.35 a.m. on the 15th.

Jupiter will set at 7.35 p.m. on the 1st and at 6.53 p.m. on the 15th.

Saturn will rise at 9.17 p.m. on the 1st and at 8.20 p.m. on the 15th.

4 June	☾	First Quarter	7 56 a.m.
11 ,,	○	Full Moon	4 12 p.m.
19 ,,	☽	Last Quarter	7 0 p.m.
26 ,,	●	New Moon	11 47 p.m.

Apogee, 16th June, at 10.54 a.m.
Perigee, 28th June, at 1.18 p.m.

Mercury will reach its greatest distance, 23 degrees west of the Sun, on the 15th, when it will be visible in the east shortly before sunrise.

Jupiter will be behind the disc of the Sun on the 20th, but at a distance of 483 million miles. If the Moon were in the place of the Sun an occultation would occur. In the case of the Sun no times of disappearance and reappearance can possibly be noted.

For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S., add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhat about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

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QUEENSLAND AGRICULTURAL JOURNAL

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Event and Comment.

Facts and Figures.

STATISTICIANS of the Commonwealth and State services assembled in Brisbane in the course of the month for their annual conference, and much useful information was made available as a result of their deliberations. Appreciation of this service to the community was expressed by the Minister of Labour and Industry, Mr. Hubert E. Sizer, when he said at a social function in connection with the conference that if ever there was a stage in Australia's progress when the people needed the guidance that could be given them only by the enthusiasm and work of the statisticians it was now. We as a people have embarked on a career of attempting to establish high standards and of teaching the rest of the world how to live. The fact that the conference had met in Brisbane was rather appropriate, for the Government had taken full cognisance of the value of the work that statisticians could do. The people generally had not yet come to appreciate how much statistical information could help them in dealing with economic problems; there was still a big majority of people who would not face facts. If the conference were able to correct that position it would be the means of radiating light among the people in forming public opinion on the right lines, which would mean a tremendous advantage to the nation in the years to come. The Government had no doubt that good results would be the outcome of the establishment of the Bureau of Statistics with Professor Brigden at the head. In the progress now being made we would need statistical information more and more, and the work of the statisticians in the present age would be tremendously magnified.

Queensland an Ideal State.

ACKNOWLEDGING Mr. Sizer's appreciative remarks and his correct appraisal of the value of the systematic collection of statistics and the economic deductions to be made from them, Mr. C. H. Wickens, Commonwealth Statistician and Actuary, said that he had heard of the magnificence of Queensland and of the warm-heartedness of the people, but since coming here he was satisfied that what he had heard was only half. The action of the Queensland Government in appointing a Director of Economics would have the approval of all statisticians, and he congratulated the Government on its selection of Professor Brigden. It always had appeared to him that Queensland was the ideal State in Australia, and he felt that it would occupy a leading position in the course of time. It had developed rapidly, and of the big States—Western Australia, South Australia, and Queensland—it had the largest area of usable land available. One of the purposes for which statistical data had been used had been the determination of wages, but in this regard he made a plea on behalf of the statisticians that they should not be held responsible for the fixation of wages. They were merely responsible for the gathering of information. The fact that the Queensland Government had appointed a Director of Economic Research would mean that the figures compiled by the statisticians would be put to better use than hitherto. He did not want to depreciate the good work of Mr. George Porter (Queensland Registrar-General) or the other statisticians, but he believed that much of the work was essentially that of an economist.

The Science Congress.

BIENNIALLY the Australasian Association for the Advancement of Science holds a congress, and Brisbane was the venue for the 1930 gathering, which opened on 28th May. That the success of the Association had far exceeded the expectations of the founder (the late Professor Liversidge, formerly of Sydney) was evident by the assembling in Brisbane of eminent scientists from every important centre of the Commonwealth and the Dominion of New Zealand. The main object of the Association is to bring together, from time to time, scientific workers from both dominions to discuss investigations on which they are engaged, as well as to stimulate general interest in research and create scientific opinion. The co-ordination of scientific research is also sought. At the conference valuable scientific and technical papers were read, and those bearing on rural problems will be subjects of extended notice in these pages in due course. Through public lectures and the Press, public interest was aroused in the latest researches of science. Largely as an outcome of the Association's activities the Council of Scientific and Industrial Research was constituted, and this body, with headquarters at Melbourne, has helped to co-ordinate and to a great extent direct the practical application of science throughout the Commonwealth. In Queensland, for example, it is specially interested in the recent developments in the eradication of prickly-pear which have demanded long, sustained, and much patient work by eminent entomologists. Other problems in course of investigation are the discovery of an insect enemy of the sugar-cane beetle, which would be of vast value to the sugar industry; the eradication of bunchy-top in bananas and remedies for other plant diseases. The best method of preserving meat, fish, fruits, and other perishable produce is also a subject of inquiry by members of the Association.

Another point of especial interest to Queensland was an account submitted to the Congress of studies of the life and conditions of our surviving aborigines. Pasture management, improvement, and research problems, all of peculiar interest to Queensland, were also discussed. Other matters affecting primary industry in Queensland that came within the range of the congressional programme were fodder conservation, stock nutrition, Australian tobacco, soil characteristics, cereal yields, pasteurisation in the dairying industry, wheat statistics, maize-breeding, lucerne-breeding, hybridisation of oats, cultural problems, field experiments, forestry, power

alcohol, pests and parasites in sheep, and agricultural economics. The Congress was successful from every point of view and the outcome of its proceedings must have a large influence on the better understanding, if not the solution, of many of our present problems.

The Gospel of Work—Sense of Service—No Room for a Leisured Class.

REVIEWING the report of the Central Technical College recently, His Excellency the Governor, Sir John Goodwin, said that it was more than satisfactory; it was really excellent, for it revealed a state of affairs and a record of achievement on which all concerned deserved to be congratulated. It was gratifying to know that the year was a record one, and in addition to the results gained by study, he sincerely congratulated the girls on their successes in physical culture, swimming, and first-aid work. He strongly held that only the best results could be obtained from the intellect if the body were sound and healthy. He was glad to know that the instruction in wool-classing was of such a really practical nature. The work carried out by the college was of an infinitely broader and more far-reaching character than could be represented by a simple record of honours obtained, of diplomas awarded, or of passes secured, important though these were. The college was teaching the most important thing of all, and that was the habit of work.

There was no more contemptible being than one who devoted himself entirely to the pursuit of pleasure. Indeed there was no greater slavery than service to one's own pleasure. He held the very firm conviction that even if individuals were so endowed with the world's goods that work for a livelihood was not a necessity, yet if they were at all worthy of their manhood or citizenship, they would have a feeling of duty to their fellows, a real sense of service, and that sense would compel them to devote some portion, at least, of their lives to the welfare of their fellow men. Service embraced all that was best in mankind. There was no place in the present workaday world for a leisured class or for a leisured individual.

''We may feel thankful and happy,'' concluded His Excellency, ''that the future men and women of Queensland are being taught to be workers and not permitted to be idlers, that all the students here are being so moulded and taught that they will become worthy citizens of their great State of Queensland.''

Poisonous Plants and Livestock.

LECTURING on poisonous plants in relation to livestock before the Science Congress, Dr. H. R. Seddon, Director of Veterinary Research, New South Wales, said that the subject was of considerable interest to workers in more than one science in Australia. He used the general term, ''poison plant,'' to include not only plants that were actually poisonous, but those which in any way disturbed the health of stock. Two methods of determining the poisonous nature of a plant were:—(1) Feeding the plant to the animal or a species reputed to be poisoned by it; (2) discovering by chemical analysis that, in a quantity of the plant such that an animal might consume, there were present some identifiable chemical substances in such a quantity that it would have poisonous effects. Were the active principles of our poisonous plants better known, the latter test might be availed of more than it was. In some instances, the quantitive test was the only means of determining the poisonous nature of the plant. The fact that a plant was poisonous to one class of animals did not mean that it was poisonous to others. Factors which influenced variation in the toxicity of a plant were locality, season, stage of growth, environment of the animal (exposure to sunlight, and exercise), and the breed and colour of an animal. The lecturer emphasised the importance of the exact botanical determination of plants known to be, or suspected of being, poisonous. Experience had taught that vernacular names varied considerably, and that plants at one time believed to be of the same species, might, on further investigation, prove to be different botanically.

THE QUEENSLAND SUGAR INDUSTRY.

By H. T. EASTERBY, Director, Bureau of Sugar Experiment Stations.

PART VI.

(b) Review of the Industry since Federation.

(Continued.)

IN the last number it was stated that the sugar industry was divided on the question of whether it was better to remain under Commonwealth control or revert to the State. The State politicians were rather keen on the industry being under State laws and regulations, while some of the Commonwealth politicians uttered dismal forebodings as to what would happen if the Commonwealth gave up control, and prophesied that the industry would be glad enough to come back again to Federal control once more. This prophecy was realised during the war period and for some years thereafter, for the reason that the Commonwealth after all controlled the tariff, and Price Boards in the Southern States were unduly depressing sugar prices.

In 1911, the Commonwealth Government decided to appoint a Royal Commission to inquire into matters relating to the sugar industry of Australia. Amongst other matters submitted to the Commission were "The operation of the existing laws of the Commonwealth affecting the sugar industry and any Commonwealth legislation relating to the sugar industry which the Commission considered expedient to recommend."

The Commission in their report (made in 1912) said the bounty regulations had served useful purposes in the past in promoting the white labour policy, and in improving the wage standard, but that the progress of events had materially diminished the value of the bounty and excise system. For practical purposes the transformation in the fields from coloured to white labour was virtually an accomplished fact as 94 per cent. of the labourers were white. The bounty system in conjunction with the excise duty had been a source of revenue to the Commonwealth Treasury, and the Commission were unable to see any adequate justification for a tax on the sugar industry. By a great body of the growers the bounty regulations were regarded as irksome in their practical working. A much more serious objection was that the bounty regulations were partial in their operation. They applied only to the growers, leaving the employee of the millers and refiners unprotected. It was an obvious anomaly that the one class of profit-earners who got the least return for the capital they invested in the sugar industry was the one class which was subject to the control of the bounty regulations. As a result of these, a certain amount of discretionary power was left in the hands of the Government of the day. This appeared to be a grave objection, it invited the intrusion of political influence and introduced an element of instability into the industry.

As far as Queensland was concerned the most preferable method of cutting out the bounty and excise regulations would be the direct prohibition by legislation of the employment of coloured labour in the canefields, and the Commission understood that the Queensland Government were prepared to act in the direction indicated. The maintenance of standard wages and conditions of labour could be, and ought to be, secured by legislation (either Commonwealth or State) embracing the whole of the industry and not applying, as the bounty regulations apply,

to one selected portion of the industry. The Commission recommended:—

> "That the bounty and excise be abolished provided that the Commonwealth Government, by co-operation with the States or otherwise, take whatever steps may be necessary to promote the white labour policy and to ensure the maintenance of a living wage in the sugar industry generally."

The Queensland Premier had already advised the Commonwealth Government that if the Excise and Bounty Acts were repealed he would be prepared to submit legislation for the exclusion of coloured labour.

It was therefore determined by the Commonwealth Government that the excise duty on sugar and the bounty should be abolished on condition of the Queensland Parliament introducing satisfactory legislation to deal with the matter. Accordingly, Acts to repeal the excise duty on sugar and the *Sugar Bounty Act*, 1905 *to* 1912, were passed providing the abolition should commence on a day to be fixed by Proclamation. In July, the following year (1913) the Proclamation was issued, and the excise and bounty regulations which had governed the sugar industry since 1902 became a thing of the past.

The legislation introduced by the Queensland Parliament consisted of the following Acts:—

(1) "*The Sugar Growers Act of* 1913,"

(2) "*The Sugar Growers' Employees Act of* 1913,"

(3) "*The Sugar Cultivation Act of* 1913."

All these three Acts were to commence and take effect on and after the date of the commencement of the Act of the Parliament of the Commonwealth intituled the *Sugar Bounty Abolition Act* 1912.

"*The Sugar Growers' Act of* 1913" provided for the prompt payment to sugar-cane suppliers of a part of the value of the cane. Upon delivery to the owner of a sugar-mill of any sugar-cane agreed to be purchased, the owner should pay to him such part of the price of the sugar-cane supplied as was equal in amount to a sum at a rate per ton in accordance with the scale hereunder:—

Name of District.	Payment per Ton of Cane Supplied.
	s. *d.*
No. 1 District	9 8
No. 2 District	9 2
No. 3 District	8 8
No. 4 District	8 2

The boundaries of the districts were the same as in the Commonwealth Bounty Regulations, but the payments were 2s. 2d. in excess of the previous rates of bounty, the excess being equivalent to the £1 hitherto retained by the Commonwealth Government.

The Sugar Employees' Act made temporary provision with respect to the rates of wages and conditions of employment in the sugar industry until such matters were dealt with by Awards under "*The Industrial Peace Act of* 1912." The rates of wages payable and the conditions of employment were the same as laid down in the Commonwealth Act of 1912 prescribing same.

The third Act was for the purpose of prohibiting certain labour in the production of sugar. By this Act a certificate could be required from certain types of labour of having passed a dictation test in such language as the Secretary for Agriculture might direct. The object of this Act was to shut out certain coloured labour or aliens as might be required, or to prevent such persons from owning or cultivating land for sugar-growing—all this in furtherance of the growing of cane by white labour. The application of the Act did not apply of course to all native-born residents of Australia of European descent—all residents of Australia of European parentage—all residents of Australia descended from any resident of the Continent of North America (other than from any aboriginal native thereof or negro or aboriginal of African or Asiatic race), nor to other nations set out in the regulations, such as Italy, Russia, &c., where treaties existed.

The abolition of the excise and bounty regulations, as applied to sugar, relieved growers of a considerable burden in making returns and filling up statutory forms.

The so-called bounty was in reality only a rebate, and out of £4 per ton of sugar levied as excise the Federal Government returned only £3 to the grower, the other £1 being retained by the Federal Treasury, so that the Sugar Bounty Act passed by the Commonwealth Government as part of the White Australia policy did not cost the people a penny; indeed, it was estimated that it put £2,600,000 into the Commonwealth funds.

Within two or three years of the introduction of the above three Acts by the Queensland Government, many changes came about, due to the war. Industrial Courts came into being for the regulation of wages. Agreements were entered into as to the price of sugar between the State and Commonwealth due to the war, and Cane Prices Boards were established. The payments of different sums for different districts provided for in the Sugar Growers' Act ceased once cane began to be purchased on its commercial sugar value. These points will be dealt with more fully later. Meantime, having finished with the Commonwealth Acts for sugar excise and bounty, we may retrace our steps and get back to earlier in the century.

In 1902, perhaps the most severe drought in the history of the sugar industry was experienced. The following comparison of the rainfalls in the various sugar districts with the average, will show the intensity of the drought, especially in the more southern sugar areas:—

Place.	Rainfall, 1902.	Average Rainfall from first taking Records up to 1912.
Beenleigh	15·07	48·87
Nambour	14·94	60·93
Childers	17·62	42·07
Bundaberg	13·30	44·40
Mackay	36·51	68·52
Ayr	11·62	44.48
Ingham	37·31	80·53
Innisfail	69·87	149·20
Cairns	50·34	90·49
Port Douglas	37·82	82·91

In the Annual Report of the Sugar Experiment Stations for 1902 it was remarked that the intensity of the dry weather was most marked in the southern districts, the ground was stone hard and manuring was out of the question on crops that were being burnt up by the drought. The Logan district had only crushed 1,500 tons of cane compared with 21,000 in the previous year, while in the Childers and Bundaberg districts it was estimated that only some 75,000 tons of cane would go through the rollers in comparison with a crop of over 300,000 tons in 1901. At Mackay, things were better though there was a big drop there also, from 230,000 tons in 1901 to 150,000 tons in 1902. Further north, about Innisfail and Cairns, the crop was more nearly normal in production per acre. As a matter of fact the 1902 crop would come almost wholly from the areas including Mackay and further north. During the 1902 drought the cane crop in the south had been largely diverted to other uses than sugar production. Naturally, when things were so dry on the coast the western areas were far worse. Not only cane tops but hundreds of acres of cane were used for feeding purposes. The value given to the stunted crops as fodder had been a very material aid to cane producers, while on the other hand the cane crop had been an actual providence to stock holders. Sugar-cane, even in poorly developed condition, was looked on as an exceptionally valuable emergency crop in periods of drought and fodder famine, such as then existed. These factors caused the crops of 1902 and 1903 to be much smaller than in 1901 and 1904. The figures are as follows:—

Year.	Tons Cane per Acre.	Tons Sugar made.
1901	1,180,091	120,858
1902	641,927	76,626
1903	823,875	91,828
1904	1,326,989	147,688

Mackay and the far North produced 90½ per cent. of the crop in 1902. As much of the cane crop was killed right out, in 1902, it greatly affected the 1903 crop also. Fourteen of the sugar mills did not crush at all in 1902, and the larger mills in the South, such as Bingera and Fairymead had very small crops to crush.

In 1904, the fact that many of the Central Sugar Mills established under the 1893 Act were not paying their way called for investigation. Some of these mills had been put in the wrong places. Others did not receive a sufficient cane supply every year to render their operations payable, and management was not as efficient as it might have been. A report was called for on the condition of certain central mills, and upon the causes which led to their present unsatisfactory state, and for recommendations, the adoption of which might produce more practical results.

The mills reported on were Gin Gin, Mount Bauple, Nerang, Moreton, and Proserpine, specifically, and the remainder in general terms. In the report it was stated that neither "*The Sugar Works Guarantee Act of* 1893" nor the regulations under that Act contained any provision for enforcing the growing of "a sufficient quantity of cane for keeping the sugar works employed." The Act, in requiring "that sufficient land to keep such a sugar works so employed and of a quality to

produce adequate crops of cane," omitted wholly to provide that central mills should be placed in localities only where an average of rainfall is assured by the records of previous years to co-operate with such land to produce cane crops. It was shown that the main effect on earning power of four of the five mills reported on was shortage of crop due to small rainfall.

The Act as it stood merely provided that the Treasury might hand over public moneys to a central mill to be engaged in the business of sugar-making under the control of the directorate selected from the members of the company, and without the co-operation, aid, or restraint of the Government which, to all intents, was a partner in the business, and was, moreover, solely responsible for the public capital that had become engaged in the business. The directors were generally men who had no knowledge of the business of sugar manufacture, nor experience in the control of large undertakings, and the shareholders comprised in the main cane farmers, men of small means whose experience had related to business on a domestic scale. It was due to the results of the provisions of the Act that such men assumed the direction of technical and commercial undertakings outside of their experience and competence.

The recommendations were that the central mills should be divided into three classes, as under:—

A. Central mills which had maintained their business in a sound condition and had met all obligations up to that date. There would be no ground for intervention in the affairs of mills of this class, and the Government should confine itself to affording any aid or advice which their directors might solicit.

B. Central mills whose business was not in a progressive or sound state and that were in arrears in their obligations. In the direction of the affairs of such mills the Government should co-operate and aid in the management and control of its business.

C. Central mills that have not met any portion of their obligations to the Treasury and whose present conditions are unsound and without assurance. Such mills should be taken over from the company by the Treasurer and their affairs controlled in the interests of the Treasury and others concerned.

As the outcome of these recommendations, a Bureau of Central Sugar Mills was established under the Treasury, whose Minister was the mortgagee and lawful representative of the State.

The mills that came under Class A were the Isis, Mulgrave, Mossman, Racecourse, Marian, Plane Creek, and North Eton Central Mills. Those in Class C which were taken over by the Treasurer as mortgagee, and the management of whose affairs was under the Comptroller of Central Mills, included Nerang, Moreton, Mount Bauple, Gin Gin, Pleystowe, and Proserpine Central Mills.

In the case of those mills which were to have come under Class B, the arrangement recommended was found impracticable owing to the opposition of the directorate to the advisory counsel of the Comptroller. The Treasurer therefore entered into possession of such sugar works, and they were included in Class C.

Subsequently, the Pleystowe Mill passed out of the possession of the Treasurer into the hands of the original Pleystowe Central Mill

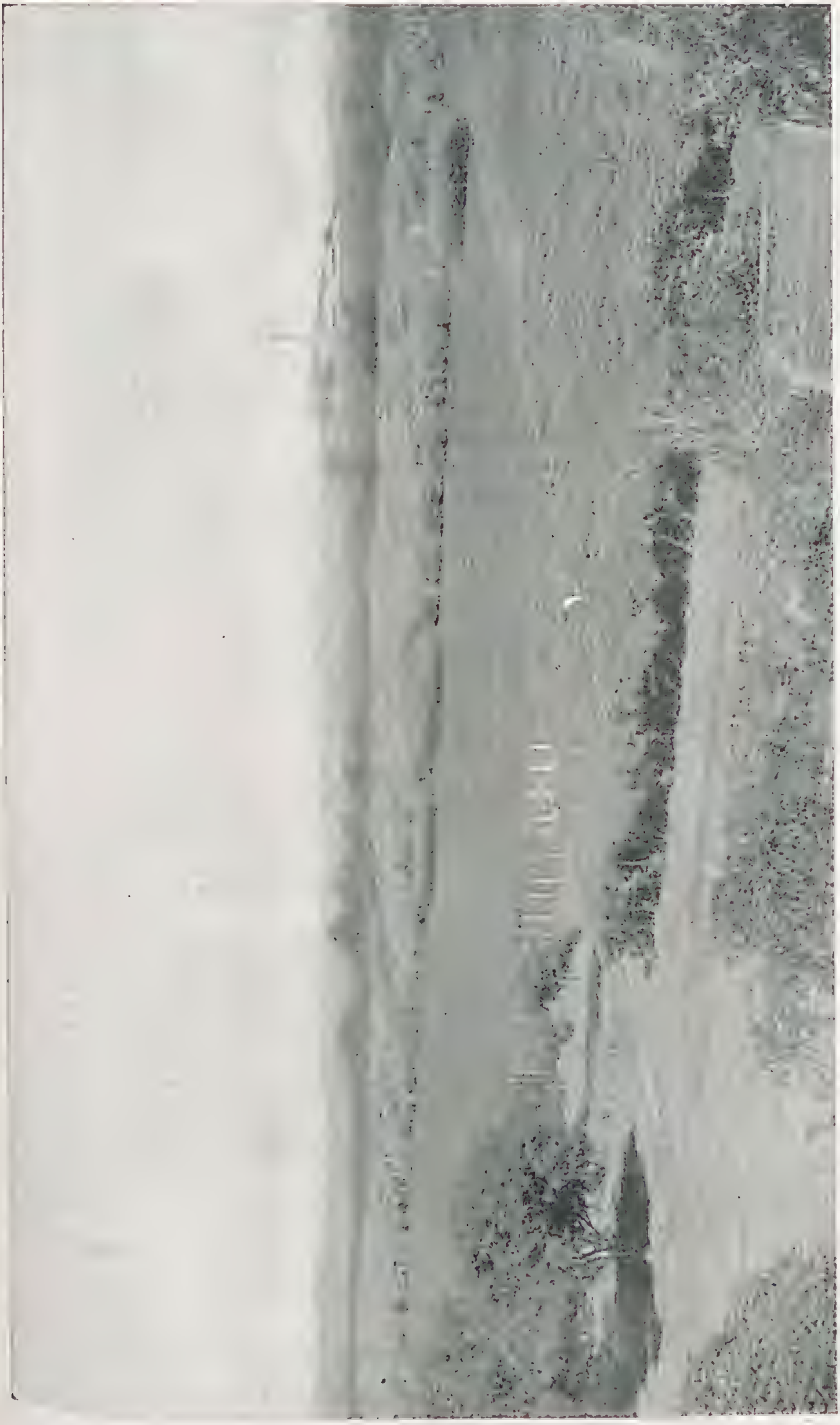

Plate 75.—On the Sugar Experiment Station at Mackay; Old Sugar Mills in the Distance.

Company, Limited, in conjunction with the Queensland National Bank; that bank paid off all arrears of money and made itself responsible for all payments until the amount of the obligation of the mill to the Treasury had been liquidated. The transfer of the Moreton Central Mill from the Treasurer to the original company took place in January, 1907, they having paid to the Treasurer an amount in total liquidation of all capital moneys and interest due thereon. By June, 1907, the Racecourse Central Mill met its final payments, and its obligations to the Treasury were totally liquidated. This was the first of the central mills to redeem its obligations without outside assistance.

The next mills to pay off their indebtedness to the Government were the Marian at Mackay—which did so during the 1909-10 season—Plane Creek (Mackay), and Mulgrave (Cairns) in 1920-1921 season, Isis (Childers) in 1921-1922 season, and Mossman in the 1923-1924 season. Nerang Mill was closed in 1918, as it had been a losing concern for years. North Eton got into difficulties, and was taken over by the Government during the 1918-1919 season.

Of the original central mills there thus remained only Mount Bauple, Gin Gin, North Eton, and Proserpine, under Government control up till the year 1928.

The erection of the new central mills at Babinda, South Johnstone, and Tully will be dealt with in a later section, as well as the disposal of Mount Bauple, Gin Gin, and North Eton to Co-operative Sugar Milling Associations, by the Government.

[TO BE CONTINUED.]

Bureau of Sugar Experiment Stations.

ENTOMOLOGICAL HINTS TO CANEGROWERS.

By EDMUND JARVIS.

LOOK OUT FOR SIGNS OF WIREWORM INJURY.

The larvæ or so-called wireworm of certain of our elaterid and tenebrionid beetles, commonly known as "skip-jacks," &c., cause considerable damage at times to newly-planted cane setts by eating the eyes or young sprouting buds, or killing the older shoots by boring into same below ground level.

These pests are pale-yellow, shining, firm-bodied creatures, which slip easily from between one's fingers.

Some of the following methods of combating them will doubtless interest Queensland canegrowers, since they refer for the most part to cultural treatment of infested soil.

1. On heavy soils, the land should be very well worked, and not allowed to remain caked on the surface.

2. Attend to the drainage conditions if necessary; this being considered a very important point.

3. Plough deeply and at the same time collect as may of the wireworms as possible by hand before planting a crop.

4. Use organic manures; increase the humus content of the soil by means of green manuring, &c.

5. In severe cases of attack, fumigation of the soil may be necessary. This can be done with calcium cyanide or benzine after pre-baiting the land with suitable seed-traps.

In the event of this becoming necessary, the grower should communicate with the Entomologist at Meringa, who will supply full information on the subject.

6. Strew poison-baits along the bottom of furrows ploughed at regular distances; a good formula is:—Bran 25 lb., Paris green 1 lb., nitrobenzene one-eighth of an ounce. Other baits or trap-plants used are sliced-carrot, rice-bran roasted dry and moistened with water, and potatoes cut on one surface and set in the soil a few inches deep and about 10 feet apart; a piece of stiff wire piercing the tuber and showing above ground serves to indicate position of the bait.

SELECTION OF GOOD SEED.

When planting, reject all setts showing tunnels of the weevil borer. Do not purchase same, if possible, from a locality or plantation known to be borer-infested. Such seed often harbours young larvæ, which later on may eat so much of a sett as to make it useless for support of the young shoots, or perhaps result in their dying, thus causing unsightly misses. By means of such diseased setts this weevil borer often obtains a footing in clean canefields, and once becoming established is not easily got rid of.

In the Burdekin district great care must be taken in this connection to select seed free from tunnels of the white-ant or "Giant Termite" (*Mastotermes darwiniensis* Frogg.).

Should a grower wish to save seed of a valuable variety of cane chancing to show evidence of the presence of this borer, such setts should be immersed for half an hour before planting in water heated to a temperature of from 55 to 60 degrees Cent. When using top plants of Badila or other soft varieties, keep a look out for moth-borers, the presence of which is betrayed by tunnels opening on to the surface of the rind, blocked more or less by webbing or pellets of excreta.

CANE PEST COMBAT AND CONTROL.

The Director of the Bureau of Sugar Experiment Stations, Mr. H. T. Easterby, has received the following entomological report from Mr. E. Jarvis, Entomologist at Meringa, near Cairns:—

RELATION OF SUGAR ENTOMOLOGY TO BIRD LIFE.

In these enlightened days of scientific research, when entomologists are so fond of voicing the merits of biological control, we are, perhaps, inclined to dwell too much upon the entomological side of the question and not enough on the advantages to be derived from a closer study of our insectivorous birds and their habits.

Although the percentage of cane pests is probably small in comparison with that accounted for by parasitic and predaceous insect enemies—which attack not only the adults but also their eggs, larvæ, and pupæ—we should not forget that the services rendered by birds in helping to maintain what is known as the balance of nature cannot be too highly valued by the man on the land.

In the year 1914, when reporting on the sheep-maggot fly pest in Western Queensland, I noticed that the question of bird preservation was intimately associated with the trouble, and that, as a general rule, timbered country or scrub land affording shelter for bird life was free from or but slightly infested by sheep-maggot flies—whilst on extensive areas devoid of trees the pest was generally at its worst. This was very noticeable both at Longreach and Emerald; those portions supporting timber being usually free from the fly, but the adjoining cleared open areas generally infested. (Queensland Agricultural Journal, Vol. I., pp. 174-181.)

Probably much of the land at present devoted to the cultivation of sugar-cane in Queensland (exceeding 224,000 acres) was originally more or less timbered country. After being cleared and planted, however, conditions very similar to those obtaining in the west with regard to bird life would naturally tend to become established throughout most of our cane land.

Deprived of suitable shelter and facilities for nesting, and forced, therefore, to retire from tracts of country on which they had been breeding in the past, the services of many of our useful insectivorous birds have been practically lost to us. To make matters worse, itinerant so-called sportsmen, continue to invade bird sanctuaries, and often for the mere lust of killing, blow to pieces every little songster they may chance to hear. Such crass ignorance is lamentable, and admittedly a crime against humanity at large, seeing that posterity is being robbed

by us in this manner of certain beautiful species of the animal kingdom which once destroyed can never be replaced. Incredible as it may seem, one occasionally hears reports of the shooting of ibises and other grub-eating birds for food by some of our own canegrowers. Such foolish slaughter, if continued, must eventually lead to several of these feathered friends avoiding the neighbourhood of canefields and feeding elsewhere. Fifteen years ago it was a common sight to see flocks of the "straw-necked ibis" (*Carphibis spinicollis*) in cane lands around Gordonvale and Highleigh picking up grubs behind the plough; but now only one or two specimens are noticed at work in a field, and in some localities this valuable bird appears to have disappeared altogether.

Growers should take note that under Clause 8A of "*The Animals and Birds Acts,* 1921 *to* 1924," our birds are the property of the Crown, and that anyone found shooting animals or birds on areas proclaimed as sanctuaries, without a written authority from the Minister (Secretary for Agriculture and Stock) is liable to a fine of £20. In the event of an offender refusing to disclose his name or place of abode to an authorised officer, ranger, or any member of the police force, or to give up his gun or other weapon together with the birds or animals killed by him, runs the risk of being fined £5, or if offering resistance, a fine of £50. Moreover, landholders are not allowed to trap birds or animals on their own selections without a permit, which, however, does not entitle them to carry on such occupation on any other selections.

The areas proclaimed as bird sanctuaries which chiefly concern the Cairns areas are:—The Shires of Cairns and Barron, the Bellenden Ker Reserve, Kuranda (Mona Mona Mission) and Lake Barrine Reserve.

Amongst the list of 123 birds which are protected during the whole of the year throughout Queensland, the following are often found in our canefields, where they render more or less important services. The larger birds (1 to 9) devour great numbers of greyback cockchafers and their grubs, and probably many weevil borers and grasshoppers; while the smaller species doubtless account for their full share of leaf-eating caterpillars, small beetles, leaf-hoppers, &c., and by helping to thin the ranks of such prolific insects prevent them from becoming serious cane pests.

1. Straw-necked Ibis	*Carphibis spinicollis*
2. White Ibis	*Ibis molucca*
3. Pewee or Mud Lark	*Grallina picata.*
4. Indian Myna	*Acridotheres tristis.*
5. Brown Hawk	*Hieracidea berigora.*
6. Leather Head	*Tropidorhynchus buceroides.*
7. Laughing Jackass	*Dacelo leachii.*
8. Fig Bird	*Specotheres flaviventris.*
9. Blue Jay	*Graucalus melanops.*
10. Australian Bee-eater	*Merops ornata.*
11. Black and White Fantail ..	*Rhipidura motacilloides.*
12. Black-faced Cuckoo Shrike ..	*Coracina robusta.*
13. Pallid Cuckoo	*Cuculus inornatus.*
14. Leaden Flycatcher	*Myiagra rubecula.*
15. Rufous-breasted Whistler ..	*Pachycephala rufiventris.*

The Director of the Bureau of Sugar Experiment Stations, Mr. H. T. Easterby, has received the following notes on the construction of machinery for fumigating scarabæid grubs, together with a brief report of experimental work against cane insects, for the period April to May, 1930, *from the Entomologist at Meringa, Mr. E. Jarvis:—*

FUMIGATING APPLIANCES.

Some Essential Points in the Construction of Machines for Fumigating Cane-Grubs.

During the present season considerable interest has been taken by some of our cane farmers in the trial of various appliances for fumigating the soil of grub-infested cane land. As a result of such field demonstrations, two pre-eminently important facts have become evident. Firstly, that a machine of this kind should not be too heavy to handle conveniently, or steer in such manner as to easily maintain a uniform distance from the line of cane being treated, despite occasional irregularities due to faulty planting or to differences in growth of individual stools. In order to obtain these desirable features it should, therefore, in the second place, be designed to inject only one side of a row of cane, instead of two sides.

In machines intended for applying liquid injections, provision must be made for regulating the depth of same, so that a fumigant can be buried uniformly at distances varying from 2 to 5 inches below the surface. The roller which is used for levelling and slightly pressing the disturbed soil lying immediately above lines of injection is also an essential provision, and tends to ensure a uniform depth of application. This must not be too heavy, from 10 to 15 lb. weight being sufficient, and should not exceed about 8 inches in width. The main wheel that drives the mechanism for dropping the fumigant should have a diameter of about 18 inches, with flat tyre 2 to 3 inches wide, provided with short iron pegs to ensure getting a good grip on cultivated land. The position of this wheel and dropper must be so arranged as to enable the operator, if desired, to inject a line of the insecticide used about 4 inches from the nearest cane shoots. This can be accomplished by putting them to one side of the machine (the right hand preferably) instead of centrally. At the same time one should bear in mind that, while drilling close alongside the rows, the horse might be forced to walk a little out of the centre, so that damage to the stools from blows of the swingle-bar would need to be overcome.

A Promising Machine.

A machine for burying dry fumigants such as calcium cyanide, nodules of paradichlor., &c., lately constructed by Messrs. Wyper Brothers, of Bundaberg, working in co-operation with the Entomologist at the Southern Sugar Experiment Station, has been tested here this season under field conditions, and given good results. This appliance, which weighs about 1½ cwt. and is designed for treating one side of the row, is easily manipulated with one horse, and, after a few minor improvements have been made, should prove serviceable next season for fumigating plant cane from 3 to 4 feet high.

Horse-drawn machines for treating grub-infested second and third ratoons have yet to be invented, and are likely to prove a difficult problem. In the case of ratoon crops one is called to deal with stools which may vary from 1 to 2 feet or more in width, while, owing to the irregular growth of side shoots and matted surface roots, it is not easy to draw a straight furrow closer than 6 to 8 inches from the nearest shoots. Such fumigation could not be expected, of course, to destroy grubs which might be feeding near the centre of big stools a foot or more away from points of injection.

The maximum success of any machine for fumigating infested soil in which the grubs present are lying at a uniform depth from the surface is not likely to be achieved on indifferently cultivated land. As pointed out in my Monthly Hints for this month (May) (see "Queensland Agricultural Journal" and "Australian Sugar Journal") it should be the aim of every grower to gradually bring the first few inches of his top soil into an even friable state by means of frequent cultivation; seeing that the establishment of such level and mechanical conditions of soil porosity tend to ensure the fumigant being administered uniformly, as regards depth, quantity, distance from the plants, and between individual doses.

Experiments Against Grubs With Ortho-Dichlorobenzene.

The samples of commercial liquid Di-chlor Benzol, and soluble Dichlorbenzol received from Sydney last November, and forwarded to this Experiment Station for trial against cane grubs, have lately been tested in our laboratory and under field conditions.

Although deadly to grubs confined in cages of moist soil—a mortality of 100 per cent. occurring within three days—ortho-dichlor. when injected in doses of 7 cc. within 3 inches of the stools caused wilting, and in many cases ultimate death of the cane. The Assistant Entomologist, Mr. Buzacott, who carried out these experiments, believes this form of dichlorobenzene to be extremely poisonous to plant life.

Results obtained later under field conditions showed that when mixed with carbon bisulphide and injected 6 inches from cane plants slight wilting took place and living grubs were afterwards found under stools so treated.

Additional experiments, however, with this fumigant will be made later with a view to discovery of some way of making it less harmful to plant life.

Spraying Experiments Against Aphides and Scale Insects.

The plant louse of sugar-cane (*Aphis sacchari* Zehn.) has been fairly plentiful this season, having occurred at Aloomba and elsewhere in sufficient numbers to attract attention from our growers. Although of minor economic interest this pest appears to have increased during the last few years rather than diminished, and on several occasions has been found attacking the young heart-leaves of cane. When

confined to the older mature foliage the damage inflicted by these plant lice is practically negligible, but in the event of severe infestation there is always a danger of the winged forms and viviparous females ultimately finding their way to the upper portions of affected stools.

This insect invariably frequents the under surface of the leaves, which, acting life a roof, afford ample protection from extremes of heat or wet weather. Owing to this habit its presence on a plantation usually remains unnoticed until betrayed by blackening of the foliage, due to the growth of a fungus called Fumagine, which grows thickly upon a sweet fluid secreted by the aphides, and which is scattered freely over the surface of an affected leaf.

Upon the first appearance of such aphis attack the lower leaves of the surrounding cane should be carefully examined, and those found to be badly infested stripped off, remove from the affected block, and laid together in a heap to be burnt.

In the event of the heart-leaves being badly attacked the aphides must be destroyed by spraying. Recent experimentation carried out at Meringa laboratory has resulted in the elaboration of the following solution, which we have found to be both cheap and effective against soft-bodied insects:—Soap, 1 lb.; crude carbolic acid, ½ lb.; water, 4 quarts.

To prepare this spray, cut up the soap, boil in the water until dissolved, stir the carbolic slowly into it, boil together for about twenty-five minutes, and strain.

This makes the stock-solution, to each part of which, before using, add nineteen parts of water. It will be found a good plan to heat the solution before spraying, to about 40 deg. Cent.

Crude carbolic acid can be obtained from the Australian Chemical Company, Donkin street, South Brisbane, at 1s. 6d. a tin, of one quart. White bar-soap ("Witch" brand) was found one of the best to use for such purpose.

A simple form of Knapsack spray-pump will be found quite suitable for this work. Use a nozzle which will forcibly deliver a mist-like spray capable of thoroughly wetting and clogging up the masses of aphides.

The more difficult problem of mealy-bug control will be dealt with in my next report.

CANE PESTS AND DISEASES.

The Pathologist to the Bureau of Sugar Experiment Stations has contributed the following notes on Sugar Cane Quarantine Districts recently declared in Queensland.

The majority of Queensland canegrowers are no doubt aware of the fact that there are a number of the more serious diseases of sugar-cane which are not generally distributed throughout the State. That is to say, any one of these diseases may be present in one district and not in others. It naturally follows, therefore, that it is a very unwise practice to take cane from certain districts for the purpose of planting in other districts. For example, owing to the presence of Fiji and gumming diseases, it would be very dangerous to take cane plants from Bundaberg to the Burdekin, where these diseases do not exist.

In order to prevent haphazard interchange of sugar-cane varieties between districts, a special proclamation has been issued under the new Diseases in Plants Act of 1929. Under the terms of this proclamation the Queensland sugar belt has been divided into nine quarantine districts, and the removal or introduction of sugar-cane plants from or into any of these districts is prohibited unless a permit in writing has been issued by an inspector under the Diseases in Plants Act.

The boundaries of the quarantine districts so proclaimed are set out hereunder:—

1. Far Northern.—The area lying north of a line drawn due west through Cardwell.
2. Herbert.—The area lying between a line drawn due west through Cardwell on the north, and a line drawn due west through Townsville on the south.
3. Lower Burdekin.—The area lying between a line drawn due west through Townsville on the north, and a line drawn due west through Bowen on the south.
4. Proserpine and Mackay.—The area between a line drawn due west through Bowen on the north, and Alligator Creek on the south.
5. Plane Creek.—The area lying between Alligator Creek on the north, and a line drawn due east and west through Rockhampton on the south.

6. Bundaberg-Childers.—The area lying between a line drawn due east and west through Rockhampton on the north, and a line following the Burrum River to its junction with the North Coast Railway, near Howard, and thence due west, on the south.
7. Maryborough.—The area between the southern boundary of the Bundaberg-Childers district on the north, and a line drawn due west through Hook Point (on the southernmost end of Great Sandy Island) on the south.
8. Moreton.—The area lying between the southern boundary of the Maryborough district on the north, and a line drawn due east and west through Brisbane on the south.
9. Logan.—The area lying between a line drawn due east and west through Brisbane on the north, and the boundary of the State of New South Wales on the south.

It should be noted that in the event of unpermitted removal of cane plants from one district to another both the person forwarding the cane plants and the person receiving them are guilty of an offence under the Act, and are liable to prosecution.

Any grower desiring to remove sugar-cane plants from one district to another should apply to the Pathologist, Bureau of Sugar Experiment Stations, Brisbane, for the necessary permit, giving reasonable notice in order to permit of an inspection being carried out.

The existing proclamation which prohibited the sale of cane plants within the counties of Ward, Stanley, Canning, and March has been rescinded. No permits will now be required for the transfer of cane plants to farmers within these counties, but a permit will be required if it is intended to send the plants out of the particular quarantine district.

Mr. R. W. Mungomery, Assistant Entomologist, Bundaberg, has submitted the following report (22nd *April,* 1930) *to the Director of the Bureau of Sugar Experiment Stations, Mr. H. T. Easterby:*—

Many varied opinions exist regarding the effects which the wet season rains have on the ordinary white grub, or cane grub as it is more commonly known in these parts, and some growers have opinions of an exaggerated nature concerning the benefits to be derived from the cyclonic rains and floods and the relationship of these latter towards the control of certain insect pests.

It is true that submergence in water has been a means of destroying many root-feeding insects, and the grape vine phylloxera is a notable example of a major insect pest being controlled in a large way by the periodical flooding of vineyards in parts of France. Again, artificial inundations have been in vogue for many years in Hungary for destroying white grubs and other insect pests in meadows, but, although the usual period of such flooding is about eight days, other investigators have shown that white grubs may remain in such flooded areas where the ground is impermeable for over a month without being destroyed.

For control to be efficient it is essential that the land should be almost level and of such a nature that, although not impermeable, water should not penetrate it easily, both of which essential conditions are not readily obtainable in our grub-infested fields. Usually land which is infested with grubs is a good friable natured soil, either red volcanic or sandy loam, and varying in contour from gentle slopes to hilly country. As a matter of fact, cane grubs are rarely found in level wet clayey situations such as would permit of easy flooding, and they certainly are not present in sufficient numbers to cause appreciable damage to cane.

To test the effect of submerging cane grubs in water, several normal healthy third-stage grubs were subjected to this treatment. When first submerged they gave several convulsive movements, and after an interval of about two minutes their movements gradually diminished until all action ceased after three minutes' immersion. To any one unaccustomed to their habits it would have appeared as if these grubs were dead, but this was not the case, as they remained in this state of suspended animation throughout the course of the experiment, and, as explained later, many of these eventually recovered.

At the expiration of one and two days respectively a number of these grubs were removed from the water and placed on moist soil, and it was surprising to note how quickly some of these recovered and commenced to dig normally into the soil. Others that were removed after three and four days immersion did not recover so quickly, and in some cases deaths occurred, but nevertheless a fairly high percentage recovered from this treatment. After five days' immersion only a small percentage

recovered, and it is considered that not many survive much greater periods than this. Seldom, however, do grub-infested fields remain under water for very long periods, and during the three weeks' continuous rainy weather in the early part of this year (January and February) some grub-infested blocks of cane were under observation, and in no case could dead grubs be found in water-logged soil that was not actually flooded.

When heavy rain falls grubs may respond in either of two ways, according to their position in the soil and the time of the year. In the one case they may retreat to a fairly clayey subsoil and enclose themselves in an impenetrable clayey cell, and in this position they are fairly secure. On the other hand, in the warmer months of the year, what usually does happen is that they approach closer to the surface of the ground, and though torrential rains may cause temporary inactivity on their part they soon become active again when a lull occurs in the rainfall. In a few cases rushing torernts may wash these pests out of the cultivation and carry them along the drains and on to the sides of the roads, where they are eaten by birds, but the percentage of control due to this factor is comparatively small. Wet weather may indirectly affect grubs by promoting a spread of fungous and bacterial diseases which are capable of causing their destruction. However, it is not so much in the death of the grubs themselves as in the general stimulating effect on the growth of the cane plant, where the main benefit of the rainy season is to be noticed.

In dry weather the plant has difficulty in maintaining its usual rate of growth, and when destruction of the roots by grub attack is added to this, a further handicap takes place. In the rainy season root development proceeds at a rapid rate of growth, and consequently the plant shows renewed vigour, all of this happening at a time when the grubs are full fed or fast approaching that condition, with the result that the grubs no longer harass the roots to any great extent and the growth of the cane plant is maintained. This recovery on the part of the plant should not therefore be attributed to the wet weather killing the grubs, but to the variety of favourable conditions operating at that particular time.

It will be apparent from this that it is futile to enjoy a false sense of security and imagine that the wet season is going to be the panacea of all cane grub worries. To allow grubs to remain undisturbed is only another means of heaping up trouble for future years. Grub-infested cane should be treated when grubs show their first signs of attack, and a clean-up campaign should be instituted, either by ploughing out the affected field and hand-picking the grubs or by fumigating the yellowing stools.

The Director of the Bureau of Sugar Experiment Stations, Mr. H. T. Easterby, has received the following report for the month ended 12th April, 1930, *from the Assistant Entomologist, Mr. A. N. Burns, Mackay:—*

Review of the Past Greyback Beetle Flight.

Contrary to the expectations anticipated from the long and continued dry season of 1929, the flight of greyback beetles was reported as being unusually large, and in the Mackay district just on 24 tons of beetles were collected and destroyed at the various mills, &c.

It is usual after a prolonged dry spell to note that many beetles perish in the soil owing to being unable to escape from their pupal cells; a natural check is thus effected and the resulting flight lessened in point of number. It is therefore quite probable that the 1929-30 flight would have been even greater if the rains had fallen a month earlier than they did—i.e., at the end of November instead of the end of December.

Collecting of beetles appeared to be much more enthusiastically and systematically carried out this season than in the past; this would probably have a slight tendency towards over comparison of the magnitude of the flight as compared with previous ones.

In view of this heavy flight, many growers will naturally think that there is soon to be heavy grub infestation, and that it should be unusually severe because there was a large flight of beetles; this does not necessarily or invariably follow. It is a recognised fact that a scarcity of any particular insect is frequently followed the next season or generation by a great abundance of it, and vice versa. Insect and fungoid parasites are doubly responsible, which in reality is only the restoration of natural balance.

Greyback Grubs (*Lepidoderma albohirtum* Waterh.) near Sarina.

Early this month a visit was paid to some of the cane areas between Dawlish and West Plane Creek, and in one instance at the former place greyback grubs were observed feeding at cane roots. Damage was only commencing, and no indications had manifested themselves in the leaves of the cane. As many as five grubs were located at some stools; these were mostly still in the second stage, and a few newly changed third-stage grubs were also noted. Whilst in the first and second stages little actual root injury is done by grubs; they subsist chiefly on humus, &c., obtained by the continual ingestion of soil. Once the third stage is reached their diet becomes almost wholly vegetable, and it is in this stage, which usually occupies about four months, that the damage to cane is done.

By the end of the present month (April) the grubs will have all reached the third stage, and growers who are usually troubled with grubs will be well advised to dig alongside a few stools in areas usually subjected to attack to see if grubs are present or not. If they are found to be present in any numbers, fumigation should be immediately undertaken. If this is done before the root systems of the cane stools are almost totally destroyed, the chances of quick recovery are much better. It is therefore clearly advisable to try and ascertain if grubs are active at cane roots before waiting until such time as the cane commences to wilt or, in extreme cases, to topple over.

Greyback Grubs (*Lepidoderma albohirtum* Waterh.) at Mia Mia.

Parts of the Mia Mia district were very severely attacked by Greyback grubs in the autumn of 1929, so it was decided to visit the same areas again this month in order to see whether the damage here this season would be likely to approach the same extent as that of last season. One block which carried Badila last season, and which was very severely attacked, was carefully examined. This field has since been replanted with Clark's Seedling principally, and examinations made alongside stools show that it will possibly be free from attack this season. At one stool only of those examined were any grubs located, and then only one.

In a patch of Q. 813 growing across a roadway grubs were plentiful, and a few stools were beginning to show yellowing in the leaves, and were commencing to lose anchorage with the soil. Q. 813 is a very poor grub-resisting cane owing to its shallow rooting system. Three Greyback grubs are quite sufficient to eat out one stool of this variety. This particular block of cane was badly attacked last year.

Taking the area inspected as a whole, it appears from present indications that it will not suffer from grub damage to anything like the extent that it did in the 1929 autumn. It is reported that the beetles were very plentiful this summer, and that large numbers were collected in the Mia Mia district. Fig trees, as is usual, were mentioned as being the most favoured feeding trees.

Notes on Fumigation with Carbon Bisulphide.

When the presence of grubs is discovered at cane stools, a careful note should be made of the depth at which they are feeding. The reason for this is that the poison should be injected to a depth slightly less than that at which the grubs are situated, because the fumes of carbon bisulphide are heavier than air, and therefore tend to penetrate downwards. The footplate of the injector can be adjusted to suit this.

It is advisable, if possible, to have the spaces between the cane rows as free from grass and weeds as possible, because the roots of these are also attractive to grubs, which after fumigation, when the poison has dispersed, may ultimately migrate to the cane roots and cause another minor infestation. Ordinarily clean cane is all that is necessary—the above only applies to cane that is very dirty and where the inter-rows are choked with weeds. Do not fumigate immediately after heavy rains, because when the soil is water-logged the poison fumes are unable to permeate the soil particles and root system. Damp or very moist soil is all right to fumigate. It is usual to allow at least two days, preferably three, to elapse after a heavy downpour before attempting fumigation. Doses of fumigant may either be injected at both sides of the stools or else in the centres of the plants. The chief advantage in the latter method lies in a saving of time in that it is necessary only to traverse each row once, whereas by placing doses on either side of the stools each row has to be gone along twice. With side plant fumigation the doses are directed towards the cane roots, and the spear of the injector is injected about 2 in. or so (not further) away from the plant. On the other hand, with central stool injection, the dose aperture is directed towards the outside of the row, one dose is given, then the aperture is turned round without withdrawing the injector and facing the opposite side, and another dose is given. It is wise to always fill in the spear-hole by pressing the earth with the foot after doing a stool. Fumigant and injectors may be procured by application to the Secretary Mackay Pest Destruction Board, Shire Offices, Wood street, Mackay.

The Director of the Bureau of Sugar Experiment Stations, Mr. H. T. Easterby, has received the following report (16th May, 1930) from the Assistant Entomologist, Mr. R. W. Mungomery, Bundaberg:—

SOOTY FUNGUS ON SUGAR-CANE.

Inquiries frequently come to hand regarding the appearance of a dirty blackish discolouration of the older cane leaves at this time of the year. Some growers view this with more concern than is necessary, thinking their cane to be smitten by some new disease which will suddenly wipe out their crops; and what appears to add weight to their ideas on this matter is the fact that often only certain varieties are affected, which would give one the impression that this was the commencement of a serious disease.

Actually, this is only a minor trouble, caused as a result of aphids feeding on the cane leaves. Colonies of these very small insects, or plant lice as they are sometimes called, are most commonly found on the underneath side of the older cane leaves, where they are attended by ants. A very intimate association exists between aphids and ants, some colonies of aphids being unable to thrive unless ants are present to look after them. Ants frequently find suitable food plants for the aphids, and when these are overcrowded, the young aphids are transferred to other plants or to other portions of the same plant which are not so thickly populated; in addition, they also afford them a certain amount of protection from their enemies. In return for this attention, the aphids secrete a kind of honey dew, which is eagerly sought after by the ants, and from this peculiar relationship, aphids have sometimes been referred to as "ants' cows."

In the case of sugar-cane aphids, some of the honey dew secreted by them falls on the surface of the leaves immediately beneath where the colonies are feeding, and this gives the cane leaves a shining, sticky appearance. Later on, a fungus commences to grow on this honey dew, and gradually extends over the whole surface on which the honey dew has fallen. The fungus is blackish in colour, and this produces the dirty, sooty discolouration previously referred to as appearing on the leaves. Living as it does on the secretions from the aphids and not on the plant tissue, the fungus has little effect on the growth of the cane plant, and the only injury it does is to block up some of the breathing pores of the older leaves.

Aphids have a short life cycle, and during their adult stage produce a large number of young. They therefore are very prolific and this accounts for their sudden appearance in large numbers in places where formerly there were no signs of them. The number of natural enemies with which they have to contend is large, ladybirds and their larvæ, certain fly larvæ, and others, all exacting toll from their colonies. Weather conditions also have a big controlling effect, and a sudden increase in the aphid population is soon brought about under control by these several agencies. Therefore, artificial control measures are unnecessary.

From this it will be apparent that this sooty fungus is only a temporary visitation, and once the aphids disappear and the older leaves fall off, the cane soon assumes its former green appearance.

Readers are reminded that a cross in the prescribed square on the first page of this "Journal" is an indication that their Subscription —one shilling—for the current year is now due. The "Journal" is free to farmers and the shilling is merely to cover the cost of postage for twelve months. If your copy is marked with a cross please renew your registration now. Fill in the order form on another page of this issue and mail it immediately, with postage stamps or postal note for one shilling, to the Under Secretary, Department of Agriculture and Stock, Brisbane.

FLAG SMUT IN WHEAT EXPERIMENTS, 1929.

By R. B. MORWOOD, M.Sc., Assistant Plant Pathologist.

After the outbreak of Flag Smut in 1928 it was deemed advisable to conduct a test of the susceptibility of the varieties of wheat commonly grown in Queensland, and also of the effect of the usual seed treatments in preventing the spread of the disease. The experiments were designed by the Plant Pathologist (Mr. J. H. Simmonds) and the necessary arrangements for carrying them out were made by the Director of Agriculture (Mr. H. C. Quodling). In the field work the writer had the able co-operation of Messrs. C. S. Clydesdale (Instructor in Agriculture), S. M. Smith, and H. Lewis at Allora. At Roma, the experimental plots were located at the State Farm where the Manager (Mr. R. E. Soutter), assisted by Mr. Ball (Assistant Experimentalist), and the farm hands co-operated with the writer. Thanks are due to Messrs. Geitz Brothers, on whose property the experiments were conducted at Allora.

Thirty-one named varieties of wheat and nine Departmental crosses were tested for susceptibility to flag smut. Canberra, which was known to be susceptible, was taken as a standard of comparison. Eight seed treatments were tested. Experiments were conducted in two localities (Roma and Allora), and in the case of the susceptibility trials an early and a late planting was made in each locality.

Experiment I.—Susceptibility Trials.

In this experiment the seed of each variety was shaken with spores of flag smut (*Urocystis tritici*). The spore material consisted of heavily infected wheat which was dried and then fragmented in a mincing machine. Approximately 1 gram of the resulting mixture of spores and chaff was shaken with 20 grams of wheat. One row of each variety was planted in each planting at each locality. The rows were made 2 chains long and spaced 2 feet apart, with the grains planted about 6 inches apart in the rows. At the beginning, and again after every fourth row, there were placed a row of Canberra wheat free from spores and one infected in the same manner as the rest of the varieties. The dates of planting were:—

Allora (first planting)	9th May
Roma (first planting)	11th May
Roma (second planting)	11th June
Allora (second planting)	4th July

At Allora at the time of making the first planting there was good subsoil moisture, but the cultivated surface layer was somewhat dry. It proved too dry for germination, and only an odd plant came up till showers one month later brought the majority through. As a result the number of plants per row was very irregular, extremes being 15 and 155. This averages about a 50 per cent. germination. The plants subsequently developed into large stools in spite of dry conditions during August and September.

The second plant, at Allora, was made following good rains early in July and germinated immediately, growing into very uniform rows.

The first planting at Roma was made under conditions somewhat similar to those at Allora, but in a rather lighter soil. A fair germination was the result. The wheat grew well to maturity in spite of getting less than 1 inch of rain from sowing till ripening.

The second planting, at Roma, was made after 40 points of rain. Soil moisture was good and an excellent germination resulted. These plants made sufficient growth for the purposes of the experiment, but were eventually somewhat stunted by the dry conditions.

The first smutted plants were observed by Mr. Soutter at the beginning of August in the plot at Roma planted 11th May, 1929. The plants were examined at intervals, and all found affected with flag smut were removed and burned after carefully recording the number per row. The symptoms varied from a few dark lines on the leaves of one small tiller, the rest of the plant being normal, to a condition of severe infection in which, in addition to the presence of the characteristic symptoms, the whole plant was reduced to a grass-like habit. The infections showing up for the first time in the later observations were mostly light, usually only one tiller being affected. The final count was made in all sections after the early-maturing varieties were ripe.

Only one smutted plant was found in the rows of Canberra free This one was explained by the breeze blowing spores from an earlier planted adjacent infected row. The freedom of the remainder demonstrated the freedom of the soil and of the sample of Canberra seed used from flag smut.

The infection per 100 plants for each row of Canberra infected is given in Table I.

TABLE I.

Row No.	Variety.	Percentage Infections.			
		Roma.		Allora.	
		Early Planting.	Late Planting.	Early Planting.	Late Planting.
1B ..	Canberra infected ..	25·9	69·6	8·6	5·6
4B ..	Ditto	45·0	46·2	10·1	3·3
8B ..	Ditto	34·7	50·6	7·6	8·5
12B ..	Ditto	33·5	52·8	8·6	2·8
16B ..	Ditto	34·9	47·0	6·1	7·4
20B ..	Ditto	10·1	49·8	6·3	6·3
24B ..	Ditto	20·7	57·8	11·8	9·4
28B ..	Ditto	35·5	46·2	5·3	5·1
32B ..	Ditto	14·7	37·2	9·7	4·6
36B ..	Ditto	15·4	54·4	10·9	5·3
40B ..	Ditto	37·6	68·0	8·0	3·5
	Mean	28·0	52·7	8·4	5·6
	P.E.	± 2·31	± 1·95	± 0·42	± 0·43

Table II. shows the percentage infection of each row and also the amount of infection compared with the average of the rows of Canberra in the planting. The former figures varied with time and place of planting, so had to be expressed in a common standard. For this purpose the average percentage infection per row of Canberra for the first planting at Roma was called 100, and the percentage infection of the other rows in this planting raised proportionately. The other plantings were then dealt with in the same manner. By this means there were obtained figures for the infection of each variety relative to the known susceptible variety.

TABLE II.—SUSCEPTIBILITY TRIALS.

Row No.	Variety.	Per Cent. Infection.				Relative Infection on Scale Canberra = 100.					
		Roma.		Allora.		Roma.		Allora.		Average.	P.E.
		Early Planting.	Late Planting.	Early Planting.	Late Planting.	Early Planting.	Late Planting.	Early Planting.	Late Planting.		
1A	Canberra free	0	0	0	1·0						
1B	Canberra infected	25·9	69·6	8·6	5·6						
1	Pinto	20·8	13·1	3·0	0·4	74·7	24·8	35·7	7·1	35·6	± 10·04
2	Cedric	53·6	40·4	20·0	3·4	193·0	76·8	237·0	60·6	141·8	± 29·20
3	Warren	10·5	15·0	1·0	0	37·5	28·5	11·9	0	19·5	± 5·65
4	Warrior	34·9	12·6	1·2	0	124·0	23·9	14·3	0	40·5	± 19·04
4A	Canberra free	0	0	0	0						
4B	Canberra infected	45·0	46·2	10·1	3·3						
5	Merridan	26·6	52·2	5·5	1·1	95·2	99·2	65·5	19·6	69·9	± 12·63
6	Novo	17·1	3·6	2·5	1·9	61·0	6·8	29·8	34·0	32·9	± 7·48
7	Beewar	10·8	49·4	1·0	0·6	38·6	93·6	11·9	10·7	38·7	± 13·08
8	Caliph	25·2	9·5	1·4	0	90·0	18·0	16·7	0	31·2	± 13·51
8A	Canberra free	0	0	0	0						
8B	Canberra infected	34·7	50·6	7·6	8·5						
9	Currawa	4·4	3·9	4·1	0	15·7	7·4	48·8	0	18·0	± 7·26
10	Florida	56·4	37·8	4·8	1·5	201·0	72·0	57·2	26·8	89·2	± 25·83
11	Watchman	30·6	67·5	15·4	5·1	128·0	128·0	188·0	91·3	133·8	± 13·52
12	Barwang	10·2	20·0	10·7	1·0	36·4	32·3	127·0	17·9	53·4	± 16·84
12A	Canberra free	0	0	0	0						
12B	Canberra infected	33·5	52·8	8·6	2·8						
13	Flora	60·5	52·0	14·3	4·5	216·0	98·8	170·0	80·5	141·3	± 21·20
14	Amby	5·4	25·0	1·7	0·6	19·3	47·5	20·3	10·7	24·4	± 5·37
15	Booraloo	15·7	35·3	5·5	1·5	56·0	67·0	65·6	26·8	53·8	± 6·30
16	Waterman	6·3	0	0	0	22·5	0	0	0	5·6	± 3·79
16A	Canberra free	0	0	0	0						
16B	Canberra infected	34·9	47·0	6·1	7·4						
17	Roma Red	6·5	2·9	1·0	0	23·2	5·5	11·9	0	10·1	± 3·36
18	Gluyas	14·3	11·2	6·2	3·7	51·0	21·3	74·0	66·2	53·1	± 7·86
19	Warchief	4·1	0·3	0	0	14·7	0·6	0	0	3·8	± 2·45
20	Three Seas	32·6	32·3	1·2	1·4	116·0	61·2	14·3	25·0	54·1	± 7·01
20A	Canberra free	0	0	0	0						

TABLE II.—*continued.*

Row No.	Variety.	Per Cent. Infection.				Relative Infection on Scale Canberra = 100.					
		Roma.		Allora.		Roma.		Allora.		Average.	P.E.
		Early Planting.	Late Planting.	Early Planting.	Late Planting.	Early Planting.	Late Planting.	Early Planting.	Late Planting.		
20B	Canberra infected	10·1	49·8	6·3	6·3						
21	Clarendon	23·2	7·5	4·1	0	82·9	14·3	48·8	0	36·5	± 12·51
22	Bunge No. 1	12·8	2·1	1·0	0	45·7	4·0	11·9	0	15·4	± 7·01
23	Budd's Early	17·4	36·5	12·6	1·9	62·2	69·5	150·0	34·0	76·4	± 18·80
24	Florence	1·6	3·9	0	0	5·7	7·4	0	0	3·3	± 1·30
24A	Canberra free	0	0	0	0						
24B	Canberra infected	20·7	57·8	11·8	9·4						
25	Pusa	12·0	5·4	3·1	0	42·8	10·3	36·8	0	22·5	± 6·94
26	B.I.P.M. 2610	1·2	0·4	0	0	4·3	0·8	0	0	1·3	± 0·69
27	B.I.P.M. 2612	0	0·5	0	0	0	1·0	0	0	0·25	± 0·17
28	B.I.P.M. 2615	1·3	0	0	0	4·6	0	0	0	1·1	± 0·78
28A	Canberra free	0	0	0	0						
28B	Canberra infected	35·5	46·2	5·3	5·1						
29	Gem	21·8	25·4	10·0	0	78·0	48·3	119·0	0	61·3	± 16·90
30	Patriot	33·5	27·5	4·1	1·5	125·0	51·7	48·7	26·8	63·0	± 14·53
31	Cleveland	58·9	79·8	5·5	0·9	209·0	151·0	65·6	16·1	110·4	± 29·19
32	Piastre	67·2	77·6	9·5	4·6	240·0	147·0	113·0	82·0	145·5	± 23·02
32A	Canberra free	0	0	0	0						
32B	Canberra infected	14·7	37·2	9·7	4·6						
33	Duke of York	22·6	27·2	5·4	1·8	80·8	51·6	64·3	33·2	57·5	± 6·78
34	B.F.G. 2613	43·5	40·2	5·4	1·7	159·0	76·4	64·3	30·4	82·5	± 18·41
35	B.I.P.M. 2604	1·3	0	0	0	4·6	0	0	0	1·1	± 0·78
36	B.I.P.M. 2608	7·9	6·3	0	0	28·2	12·0	0	0	10·0	± 4·50
36A	Canberra free	0	0	0	0						
36B	Canberra infected	15·4	54·4	10·9	5·3						
37	B.I.P.M. 2609	5·5	5·9	2·9	0	19·7	11·2	34·5	0	16·3	± 4·90
38	Nabawa	1·5	1·2	0	0	5·4	2·3	0	0	1·9	± 0·86
39	Coronation	29·8	47·3	11·9	3·0	106·0	89·8	141·0	53·6	97·6	± 12·41
40	Pilot	18·3	20·7	2·6	0	65·4	39·4	31·0	0	33·9	± 9·09
40A	Canberra free	0	0	0	0						
40B	Canberra infected	37·6	68·0	8·0	3·5						

The only varieties which were definitely proved to be less than one-twentieth as susceptible as Canberra were the Departmental crosses B.I.P.M. 2612, 2604, 2615, and 2610. There were no significant differences between these crosses, though there were strong indications that they were more resistant than B.I.P.M. 2608 and 2609.

Nabawa and Florence proved to be less than one-tenth as susceptible as Canberra. Less than one-fifth as susceptible are Warchief, Waterman, and Roma Red.

The figures given for the susceptibility are only approximate owing to the limited number of trials and great variation of the figures in the trials. In arranging the wheat in groups, both mean and the extreme values are considered. Those placed in the moderately susceptible column are certainly less susceptibe than Canberra.

TABLE III.

HIGHLY RESISTANT.		RESISTANT.	
B.I.P.M. 2612	0·25 ± 0·17	Warchief	3·8 ± 2·45
B.I.P.M. 2604	1·1 ± 0·78	Waterman	5·6 ± 3·79
B.I.P.M. 2615	1·1 ± 0·78	Roma Red	10·1 ± 3·36
B.I.P.M. 2610	1·3 ± 0·69		
Nabawa	1·9 ± 0·86		
Florence	3·3 ± 1·30		
MODERATELY SUSCEPTIBLE.		**SUSCEPTIBLE.**	
B.I.P.M. 2608	10·0 ± 4·50	Warrior	40·5 ± 19·5
Bunge No. 1	15·4 ± 7·01	Barwang	53·4 ± 16·84
B.I.P.M. 2609	16·3 ± 4·90	Three Seas	54·1 ± 15·47
Currawa	18·0 ± 7·26	Gem	61·3 ± 16·90
Warren	19·5 ± 5·65	Patriot	63·0 ± 14·53
Pusa	22·5 ± 6·94	Merridan	69·9 ± 12·63
Amby	24·4 ± 5·37	Budd's Early	76·4 ± 16·80
Caliph	31·2 ± 13·51	Bobs-Flo Gl. 2613 ..	82·5 ± 18·41
Novo	32·9 ± 7·48	Florida	89·2 ± 25·83
Pilot	33·9 ± 9·09	Coronation	97·6 ± 12·41
Pinto	35·6 ± 10·04	Canberra	100·0 ± 2·64
Clarendon	36·5 ± 12·51	Cleveland	110·4 ± 29·19
Beewar	38·7 ± 13·08	Watchman	133·8 ± 13·52
Gluyas	53·1 ± 7·86	Flora	141·3 ± 21·20
Booraloo	53·8 ± 6·30	Cedric	141·8 ± 29·20
Duke of York	57·5 ± 6·78	Piastre	145·5 ± 23·02

Experiment II.—Seed Treatment Trials.

Canberra wheat was used for this experiment, and with the exception of the seed for the Canberra free rows was shaken with flag smut spores at the same rate as in the susceptibility trials. Three pairs of Canberra free and three of Canberra infected were planted as distributed checks. Two rows of each of the following treatments were planted and in most cases a third row of treated seed subsequently reinfected.

Bluestone.—The seed was treated by immersion in a 1½ per cent. solution (1½ lb. to 10 gal.) of bluestone for three minutes. It was then allowed to dry before planting.

Bluestone Kept.—This was treated in the same manner as above, but the treatment was made on the 3rd of May and planting took place at Allora on the 10th and Roma on the 13th.

Bluestone Lime.—The bluestone treatment was the same as the two former and was then followed by immersion in 1 per cent. milk of lime for three minutes.

Formalin.—Ten minutes in a solution consisting of one part of commercial formalin in 400 parts of water.

Copper Carbonate—Tillantin R.—U.T. 685.—The seed was shaken with the various dusts at the rate of 2 oz. per bushel.

Hot Water.—The seed was soaked for five hours at room temperature and then maintained one lot at a temperature of 125 deg. Fahr. for ten minutes and the other at 129 deg. Fahr. for ten minutes.

Duplicate plantings were made at Allora and Roma each at the time of the first planting of the susceptibility trials and under the same conditions, except that, at Roma, the drills were watered to ensure germination. Two hundred seeds were planted per row, and the resultant plants counted so that the effect of seed treatment on germination could be observed. The final figures are given in Table IV.

TABLE IV.

PERCENTAGE GERMINATION OF EXPERIMENT II.

Treatment.	Roma.		Allora.		Mean.
	1st Row.	2nd Row.	1st Row.	2nd Row.	
Bluestone	97·5	96·5	58·0	60·0	87·3
Bluestone subsequently infected	97·0	..	61·0	..	
Bluestone kept	89·5	96·0	59·5	60·0	76·2
Free untreated	97·5	95·5	63·0	67·0	80·7
Infected untreated	93·5	97·5	69·0	62·5	80·6
Bluestone lime	96·0	98·5	67·0	74·0	83·8
Formalin	88·0	91·5	69·0	59·0	76·0
Formalin subsequently infected	95·5	..	53·5	..	
Free untreated	96·5	95·5	55·5	56·0	75·8
Infected untreated	94·0	95·5	63·0	77·0	82·3
Copper carbonate	96·5	97·5	68·5	59·5	79·8
Copper carbonate infected	95·0	..	62·0	..	
Hot water 125° F.	65·0	62·5	47·5	43·5	53·0
Hot water 129° F.	65·0	59·5	33·5	34·0	48·0
Hot water 125° F. subsequently infected	63·5	..	36·0	..	..
Free untreated	94·5	92·5	64·0	67·0	79·5
Infected untreated	94·0	97·0	63·5	56·5	77·7
Tillantin R.	96·0	97·5	52·5	63·0	78·5
Tillantin R. subsequently infected	97·5	..	64·5	..	
U. T. 685	95·5	94·0	63·5	68·0	80·6
U. T. 685 subsequently infected	100·0	..	63·0	..	
Average of infected untreated	95·6		67·3		79·4

Examination of the germination results shows no reduction from treatment of seeds with the dusts: copper carbonate, Tillantin R., and U.T. 685. With formalin and blue stone the difference is so small that considerably more elaboration would be needed to prove a reduction. Treatment with lime after bluestone may make a difference under some conditions.

With the hot water treatment there was a consistent reduction of germination capacity, particularly marked at Roma, where the distributed checks varied from 92 per cent. to 97 per cent., whereas the three rows of seed treated with hot water at 125 deg. Fahr. registered 65 per cent., 62 per cent., and 63 per cent. It is to be noted that in the treatment the seed was not immediately cooled after treatment. Small subsidiary experiments were later carried out at the Department which proved that when the seed is cooled by quenching in cold water immediately after taking from the hot then the reduction in germination is not significant. The effect of such procedure on the effectiveness of the treatment has not been demonstrated in this series of experiments.

The amount of infection found in the rows is shown in Table V.

TABLE V.

Treatment.	Percentage Infection.		Relative Infection on Scale Average Untreated Infected = 100.		Average.
	Roma.	Allora.	Roma.	Allora.	
Bluestone	0	0	0	0	0·7
Bluestone	0·6	0	2·8	0	
Bluestone subsequently infected ..	1·6	0·8	7·4	11·2	9·3
Bluestone kept	0	0	0	0	0
Bluestone kept	0	0	0	0	
Free untreated	0	0	0	0	0
Free untreated	0	0	0	0	
Infected untreated	15·5	5·7	71·6	81·5	81·5
Infected untreated	25·0	4·0	115·0	57·0	
Bluestone lime	1·2	0	5·5	0	3·9
Bluestone lime	0	0·7	0	10·0	
Formalin	0·6	0	2·7	0	0·7
Formalin	0	0	0	0	
Formalin subsequently infected ..	4·3	1·9	19·8	27·2	23·5
Free untreated	0	0	0	0	0
Free untreated	0	0	0	0	
Infected untreated	21·0	10·6	97·0	151·0	106·9
Infected untreated	24·8	4·6	114·0	65·8	
Copper carbonate	8·5	3·0	39·2	42·9	85·4
Copper carbonate	14·2	13·6	65·5	194·0	
Copper carbonate subsequently infected	33·5	12·1	154·0	173·0	163·5
Hot water 125° F.	0	0	0	0	0
Hot water 125° F.	0	0	0	0	
Hot water 129° F.	0	0	0	0	0
Hot water 129° F.	0	0	0	0	
Hot water 125° F. subsequently infected	33·6	9·7	154·0	138·0	146·0
Free untreated	0	0	0	0	0
Free untreated	0	0	0	0	
Infected untreated	20·0	12·0	92·5	171·0	112·4
Infected untreated	24·0	5·3	110·0	76·0	
Tillantin R.	12·1	6·7	55·8	95·8	90·4
Tillantin R.	16·9	9·3	78·0	132·9	
Tillantin R. subsequently infected ..	38·8	17·2	151·0	246·0	198·5
U. T. 685	23·5	8·7	108·0	124·0	120·5
U. T. 685	20·9	8·2	134·0	116·0	
U. T. 685 subsequently infected ..	27·6	16·0	127·0	228·0	177·5
Average infected untreated	21·7	7·0			

TABLE VI.

SUMMARY EXPERIMENT II.

*Relative infection on scale average infected untreated = 100.

—	Infected before Treatment.	Subsequently Reinfected.
Untreated	100·0	*
Bluestone	0·35	9·3
Bluestone lime	3·9	*
Formalin	0·7	23·5
Hot water 125° F.	0	146·0
Hot water 129° F.	0	*
Copper carbonate	85·4	163·5
Tillantin R.	90·4	198·5
U. T. 685	120·5	177·5

*No rows with these treatments subsequently reinfected were included in the experiment.

Hot water treatment for ten minutes at 129 deg. Fahr. appears to be the only absolute control of seed infection of this smut, having the further advantage of controlling all wheat smuts when carried with the seed. It has the disadvantages of impracticability under the conditions prevailing on the majority of wheat farms and of not controlling subsequent contamination.

Bluestone and formalin almost completely controlled the artificially heavy infection used in the experiment. Such seed would never be planted by an intelligent grower. These treatments would probably give practical control of the lighter infection usually present. Bluestone seemed to be the only treatment giving reasonable control of subsequent contamination. This is important since flag smut infection can take place from the soil.

Bluestone followed by lime appeared to be less effective than bluestone alone. The dust treatments were ineffective. Whether or not they will control light infections is now being tested.

Summary.

The outstanding results of the year's work are the confirmation in Queensland of the high degree of resistance of Nabawa and Florence which has been demonstrated in other States, and the demonstration of a similar or greater degree of resistance in promising Departmental crosses.

It has also been demonstrated that dust treatment of seed wheat is ineffective against heavy infections of flag smut. Probably the recent outbreak of flag smut would have been prevented had growers all regularly used the bluestone seed treatment. Copper carbonate has also been found by several experimentors to be ineffective against heavy infections of bunt.

OBITUARY.

MR. E. T. BELL, M.L.A.

The death of Mr. E. T. Bell, member for Fassifern in the Legislative Assembly, on 2nd May, removed from our midst a very fine personality and one who rendered good service to the State, both in peace and war.

In the countryside particularly he will be greatly missed, for probably no public man commanded such general respect, or enjoyed more genuine popular esteem. Round about the district he represented in Parliament for seventeen years, his loss is most deeply deplored, for there his genial, kindly nature and his many acts of disinterested and neighbourly kindness, his loyalty to the things we value most highly in public and private life were widely known and appreciated, and will long be remembered. His standards were high and measured up to lofty ideals of public service. He was content to give of his best to his native State, both as a pastoralist and a Parliamentarian, and during the great war he served Australia as a commissioned officer in the Navy.

The late Mr. Ernest Thomas Bell was born at Camboon, on the Dawson River, on 31st March, 1880. He was a son of the late Mr. J. T. M. Bell, a native of the Hawkesbury district of New South Wales, who was one of the early pioneers of the pastoral industry in Queensland, owning Coochin Coochin, Wallabella, Camboon, and Combargno Stations. He was educated at the Ipswich and Toowoomba Grammar Schools. Following a period of training on Coochin Coochin he became manager of Combargno Station, in the Roma district, holding that position for about three years—until, in 1903, on the death of his father, he returned to the home station and administered the affairs of all the properties of the late Mr. J. T. M. Bell, to which Planet Downs Station was subsequently added. At the by-election for Fassifern in 1913 the late Mr. Bell, in response to a widely supported request, offered himself as a candidate, and won by no fewer than 1,566 votes. Since then he had been re-elected at each general election. In 1910 he married a daughter of the Hon. W. F. Taylor, M.D., of Brisbane, formerly a member of the Legislative Council of Queensland, who, with several children, survives him.

The Acting Premier (Mr. R. M. King), on behalf of the Government, expressed profound regret at the loss through his untimely death of so valuable a member of the party as Mr. Bell, who, he said, was held in the highest esteem by both sections of the House. His genial and kindly nature endeared him to everyone, political friends and Opposition alike. Mr. Bell was a very useful member of the House; his knowledge of land and pastoral matters was of the utmost assistance to the Government, and his broad grasp of matters generally affecting the welfare of the State was also most useful to members of the Government.

"I regret the passing of Mr. Bell, who was a personal friend of mine for many years. The public life of Queensland is much the poorer for his loss," said Mr. King, who added that he was conveying the sympathy of the Cabinet to the widow, family, and relatives.

PLATE 76.—CATTLE COUNTRY, WEST MORETON, QUEENSLAND.

SHEEP ON THE COAST.

ADVICE TO FARMERS.

By J. H. HODGE, Instructor in Sheep and Wool.

AS a golden rule I would lay it down that the farmer must first learn that he has to choose a breed of sheep suitable for his country. It does not follow in the least that because a farmer in one locality has been successful with a certain breed of sheep, another farmer in a different place is going to do equally well with that breed. The right choice of a breed (possibly crossbreds) spells the difference between success and failure.

It may be taken in a general way that the pure merino is not suitable for farmers' sheep in the localities of which we are speaking, nor in districts where the rainfall is excessive.

Fat Lambs.

It must be borne in mind that the production of wool in farmers' flocks on the coastal areas is purely of a secondary consideration. Farmers should concentrate on fat lambs maturing at five and six months of age, and in this connection it is always advisable to have available some fodder crop so that the lambs come right away from the time of birth without a check.

It is desirable also that when choosing a breed the farmer should keep in mind the consequences of a bad season. That is, it may happen in a certain season that his lambs are not fit to market. In the selection of the right breed in this case the ewe lambs can be saved as future mothers in the flock, and the wether lambs (as wethers) fattened as opportunity offers.

The Right Flock.

Having selected the right breed, then (and in this case I would strongly urge the farmer to get the advice of the officers of the Department of Agriculture and Stock) it is essential to success that the prospective owner find the right flock. Here again official advice might be sought.

Having settled on a line and purchased, it is strongly urged that the sheep be drenched twice within eight days for stomach worms straight away. There are many prepared proprietary drenches on the market with full instruction as to dilution and application. If one of these drenches is proposed for use, it may be well for the farmer to write the Department, when advice will be sent as to whether such drench is suitable or otherwise. The Department recommends a drench, and full particulars as to ingredients, preparation, and method of application to the sheep can always be had on request. Let it be understood that the Department is on all occasions out to help the farmer with sheep, and let it be urged that the farmer make full use of the facilities provided.

Farmers' Wool.

With regard to the wool from the flock, the Department has an excellent scheme by which the farmer is assured of full value for his wool. All that is necessary at shearing time is for the farmer to send his clip unskirted to the Department, advising the Under Secretary of despatch.

Locks and bellies should be kept separate. All the rest of the wool may be baled and sent in as it comes off the sheep's back. A charge of 10s. per bale is made. It does not matter how small the parcel of wool is. Highest prices are assured, for under this scheme all small lots (or stars) are eliminated, as far as possible, and the wool is offered in the main catalogue. The scheme is available to all owners of 1,500 sheep and under.

The Cross Required.

In those parts of the coastal lands with a rainfall of over 45 inches, I would like to see farmers form their flocks with a Romney Marsh-Merino cross, the progeny of the Romney ram, on the big bold strong type of merino ewe. There is at present in Queensland great difficulty in getting the type of ewe required, but I have reason to believe that, in the near future, there will be available supplies of ewes (bred on the lines recommended) for the farmer.

Too much importance cannot be attached to this recommendation—i.e., the right ewe. In cases where farmers are already breeding with more or less success from the Merino, I would urge them to introduce a Romney Marsh ram with the idea of saving their ewe lambs as the basis of a future flock.

The Corriedale is a comparatively new breed, but has already proved itself an ideal general utility sheep where local conditions suit it. It grows a strong bulky fleece of commercial value, and the ewes are great mothers. I consider there is a great opportunity for some farmer to breed a pure flock of Corriedales in these areas, with the object in the near future of supplying other farmers with purebred stock.

If fat lambs are required with the Corriedale ewe as the basis of the flock, I would recommend the introduction of the Border Leicester or Dorset-horn ram. Both crosses throw fine early-maturing lambs, but in this case care would have to be exercised in seeing that the whole crop was ready as fat lambs.

The Main Handicaps.

The two main troubles in connection with sheep in these parts are likely to be stomach worms (already referred to) and dogs, both wild and domesticated.

If the paddocks where it is intended to run the sheep are not netted against dogs, yarding at night and a careful watch by day will have to be resorted to. Careful handling on all occasions is essential, and the sheep should be in the yard for as short a time as possible. It must always be remembered that although the breeding is a very fine thing, there is a true saying that "half the breeding goes down the throat." In choosing a position for the yard be careful to see that it is on high well-drained land, as well sheltered as possible. This advice refers, too, to the drafting yard, which in all probability would be part and parcel of the "sheep fold" or night yard.

Should ticks or lice appear in the flock, advantage should be taken, where possible, of any dip which has been freshly prepared and before any cattle go through it.

Dips.

The cattle dip is not ideal for sheep on account of the tarry substance contained, but the sheep will stand the strength, and in small lots, and with the exercise of care, sheep may be put through with advantage for the purposes mentioned. Should the flock be large enough to warrant a dip, or could neighbours combine for the purpose, it would pay well to erect a cheap dip. These can be purchased (metal) in different lengths at different prices. Where small numbers are handled the cost of yards and dip should not be great. The dips recommended are well known, and full instructions are given with the material. In this case, again, if in doubt, consult the Department.

A shower dip suitable for a small owner can be very economically erected. This consists of a cement base built with a suitable fall to one corner in which is a cement well sufficiently deep to allow a pump to be used for the purpose of pumping the liquid back again to the tank. The top is perforated and a hand pump of sufficient strength is used. The sheep are gently crushed into the dip under the shower and the pump set to work. This shower dip is quite successful even with large flocks, and has the great advantage that even ewes heavy in lamb can be operated upon without injury. The cost to a farmer should be comparatively small. About six minutes under the shower and four minutes draining should prove satisfactory.

Fat Lambs.

Where a crop of fat lambs is the object of the farmer the greatest care should be taken to see that the lambs suffer no check from birth to market. For this purpose a fodder crop is urged.

Where it is possible to grow lucerne, nothing can beat it, and the farmer is recommended to grow this on any well-drained area where it has been proved, or to try it in an economical way even if none has been previously grown.

Lamb-marking (or castration of the ram lambs) forms one of the operations. This should be done with the greatest care and cleanliness, and should be carried out when the lambs are from a fortnight to a month old. A recognised antiseptic should form part of the equipment at marking time, and the knives and earmarkers frequently dipped in same. The yard itself should be clean, and all old wools, refuse, &c., burned. This is a precaution against tetanus or lockjaw. The operation itself should be conducted by a man of experience, and here again the Department is prepared to send an officer to give a demonstration.

The farmer should register an earmark. After the testicles are removed (and it is recommended to draw them with the teeth) and the earmark put in, the tail is docked about two inches from the rump. Great care has now to be exercised in the application of a preparation to the wounds. The substance used should be both curative and antiseptic.

A good dressing may be made from Stockholm tar, fat, and dip. Heat the tar and fat in equal proportions together and add the dip. Apply the dressing with a swab (on a stick) to the purse and tail.

Care after Marking.

After lamb-marking the lambs should be carefully examined daily to see that they have not been attacked by blowflies. Should such be the case all maggots should be removed, wool shorn from the affected parts, and the wounds again dressed with a solution of sheep dip or some other preparation recommended for the purpose. When sending lambs to market drive as slowly and carefully as possible. Never load the lambs in a heated condition.

Lambing Time.

With regard to the time for lambing in these coastal lands, June, July, or August are recommended as the most suitable months. With no check in the lambs, this should insure marketable lambs towards the end of the year, when the price can generally be relied upon to be the best. This would mean mating the rams in January, February, and March. In this connection, it is interesting to note that the long-wooled English breeds are shy breeders except at their own particular season. Our Australian Merinos, on the other hand, will mate at any season of the year.

Over a period of two years fat lambs have sold excellently in Brisbane from 15s. to £1 7s. 6d. per head. With the fleece, and taking it on a basis of 75 per cent. lambs, I do not think I am unduly optimistic in saying that a farmer should nett at least £1 per ewe, and probably, at present prices for lambs, more.

It is advisable where the sheep are not doing well, or some soil deficiency is proved, that the sheep be given a lick. Nauru phosphates and salt (not too coarse) in equal parts with the addition of, say, 1½ oz. iodine to the 100 lb., is a suitable lick. In addition to toning up the flock generally, a proportion, in the form of phosphoric acid, finds its way back to the land with benefit to the pastures.

Fat lambs intended for market or export should never be weaned. Straight from the teat to the block is the maxim in this trade. The ideal weight for a lamb at, say, five months is from 33 to 37 lb.

CARE OF THE CAR.

MACHINERY MANAGEMENT.

THE traveller through country districts of Australia, who happens to have any knowledge of machinery, is invariably amazed at the rough treatment meted out to all forms of machinery used in the Australian country.

Many years ago, when the horse was the farmer's chief assistant, the farmer who was not a good horse boss was somewhat despised by his neighbours. Unfortunately there is no such feeling with regard to machinery, and it is the general rule to see all sorts of machinery badly abused in the country districts of the State.

Admittedly no discomfort is caused to any living thing because a tractor goes unhoused all through a wet winter, but it is a fact that the pocket of the owner is badly hit when machinery is abused or neglected.

The motor car together with other machinery on the farm, comes in for its share of abuse and neglect and since the car is both an expensive and comparatively delicate piece of mechanism, its abuse and neglect costs the owner very dearly.

The Garage.

Any car, no matter how cheap, is worthy of a weatherproof garage. A building with wooden walls and a galvanised iron roof can be erected for a few pounds and it will save its price in twelve months.

The garage should be a complete building, however, and not a half-built shed with only a roof and one or two walls. It is not at all unusual to see a good car stabled alongside a house or a shed with possibly a few sheets of iron above it to keep off direct rain but without walls, thus the car is continually

exposed to wind and moisture, and very often to the sunlight. If the owner of such a shed is approached and asked why he does not build a better one, he will almost invariably excuse himself with a story about shortage of cash for such improvements. The writer has no hesitation in saying that the man who cannot afford a decent shed for his car cannot afford a car.

The ill-effects of leaving a car in the weather continuously are that the paint-work perishes, the tyres perish, the woodwork shrinks, the upholstery and hood perish, the body rusts, and in fact, all steel parts rust, and the electrical wiring perishes. In short, the car quickly becomes a shabby wreck.

What has been said about the effects of neglect on the car applies also to the tractor, harvester, plough, or other farming machinery.

The reader who doubts the value of thorough care for machinery should do a little calculating as to the cost per annum of his machinery, motor-car included. He will readily see that by doubling the life of his plant he can save himself a few pounds a week.

To take proper care of the car a good supply of water should be available, and the bodywork should be washed at least once a week in order to remove mud and dust that might otherwise become almost a permanent portion of the car. Water supplied through a hose is the ideal supply for washing the car. Unfortunately many properties in country districts are lacking in a suitable source of water supply, but wherever there is a good well available a small pumping plant and a water reticulation scheme around the home is a wonderfully profitable investment.

The Repair Shop.

Many car owners to-day never touch their cars to do repair work, but prefer to leave it all to the local garage. This policy is probably a good one for the city man, but every farmer should be something of an amateur mechanic, as the modern farm has far too much machinery upon it not to require the care of an owner who knows something of machinery.

The first essential to a small workshop is a decent bench and vyce. The bench should be at least 6 feet long, 2 feet wide, and be supported by at least six legs of 3-inch by 3-inch or larger material.

The top of the bench should be made of timber at least 2 inches thick and to this top a good vyce should be screwed. A most serviceable type of vyce is one with 3-inch parallel jaws. The vyce should be arranged so that the top of the jaws are at about the same height above the floor as the elbows of the man who is going to use it.

A row of shelves at the back of the vyce, divided into compartments for nuts, bolts, screws, small tools, &c., is very useful. These shelves should contain the following tools:—Two 10-inch flat files, one rough, one smooth, a ¼-inch round file, and a small triangular file, also an engineer's hammer with a 1¼-lb. head, together with a selection of cold chisels and punches is absolutely necessary.

An assortment of reliable spanners is essential. A full set of both box and block spanners suitable for car repair and general work should range from three-sixteenth inch to five-eighth inch. Larger nuts than this size are comparatively rare, and a big screw wrench should suffice for handling the few that are met with. When buying spanners it is always advisable to buy the best, as the jaws of an inferior article are always liable to spread or break. The tool kit should also contain a variety of good screwdrivers, a pair of footprints, a pair of snips, a medium-sized soldering iron, a hacksaw and blades, and, last but not least, a small breast brace, together with a set of drills and a small emery wheel to grind the drills.

The tools mentioned are only a nucleus for a much larger kit which the amateur mechanic will purchase soon after he begins to take an interest in his repair work. Such tools as a forge, an anvil, a blow lamp or a large drilling machine are extremely useful in the hands of those who have some idea how to use them.

It does not need a very keen observer to realise that farming has been mechanised, particularly wheat-farming. It follows naturally that the good farmer must be a good amateur mechanic, as he has a car and much other machinery to care for. On every hand one hears the slogan "grow more wheat." The farmer realises that he must have a reasonable profit and to obtain this the wheat must be produced economically. No doubt there are numerous ways of doing this, but at least one way is to take more care of the farm machinery and so reduce expenditure on plant.—"RADIATOR," in "The Farmer and Setttler."

CLIMATOLOGICAL TABLE—APRIL, 1930.

SUPPLIED BY THE COMMONWEALTH OF AUSTRALIA METEOROLOGICAL BUREAU, BRISBANE.

Districts and Stations.	Atmospheric Pressure. Mean at 9 a.m.	Shade Temperature.						Rainfall.	
		Means.		Extremes.					
		Max.	Min.	Max.	Date.	Min.	Date.	Total.	Wet Days.
Coastal.	In.	Deg.	Deg.	Deg.		Deg.		Points.	
Cooktown	29·94	85	..	86	23,26	..	..	190	11
Herberton	..	76	59	80	1,9	56	15,26, 27,28	129	9
Rockhampton	30·04	84	63	87	25	53	27	193	6
Brisbane	30·08	78	60	84	25	55	13	225	9
Darling Downs.									
Dalby	30·09	77	51	83	1	37	27	198	7
Stanthorpe	..	70	47	80	3	33	27	387	11
Toowoomba	..	68	50	78	3	39	27	258	7
Mid-interior.									
Georgetown	29·93	91	62	94	9,11	56	12,28	..	..
Longreach	29·99	89	62	95	4	53	11,12,26	3	1
Mitchell	30·07	80	52	86	1,7	38	27	99	4
Western.									
Burketown	29·93	91	68	96	2,9	59	13	..	..
Boulia	29·97	90	60	97	21	51	27	..	..
Thargomindah	30·05	82	59	94	22	51	25	10	2

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF APRIL, IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALL DURING APRIL 1930 AND 1929, FOR COMPARISON.

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	April.	No. of Years' Records.	April, 1930.	April, 1929.
North Coast.	In.		In.	In.
Atherton	4·30	29	0·53	5·52
Cairns	11·71	48	4·73	3·78
Cardwell	9·15	58	1·01	2·37
Cooktown	8·90	54	1·90	6·53
Herberton	3·95	43	1·29	0·99
Ingham	8·15	38	3·07	5·10
Innisfail	20·41	49	5·81	4·32
Mossman	9·02	17	1·15	4·29
Townsville	3·54	59	0	2·50
Central Coast.				
Ayr	2·68	43	0	6·23
Bowen	2·88	59	0·12	10·08
Charters Towers ..	1·63	48	0·11	2·17
Mackay	6·62	59	2·90	14·10
Proserpine	6·25	27	2·28	12·29
St. Lawrence	2·98	59	0·39	9·55
South Coast.				
Biggenden	2·19	31	0·76	9·05
Bundaberg	3·17	47	0·98	7·25
Brisbane	3·75	78	2·25	9·84
Caboolture	4·37	43	1·63	10·25
Childers	2·89	35	1·93	7·65
Crohamhurst ..	6·65	37	3·42	16·66
Esk	3·05	43	2·11	8·27
Gayndah	1·41	59	1·20	5·23
Gympie	3·44	60	1·06	9·92
Kilkivan	2·23	51	2·22	8·41
Maryborough ..	3·77	58	2·70	12·75

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	April.	No. of Years' Records.	April, 1930.	April, 1929.
South Coast—continued:	In.		In.	In.
Nambour	6·25	34	3·61	19·42
Nanango	1·92	48	0·72	4·47
Rockhampton ..	2·84	43	1·93	8·98
Woodford	4·56	43	1·66	8·84
Darling Downs.				
Dalby	1·30	60	1·98	2·96
Emu Vale	1·26	34	1·29	2·31
Jimbour	1·32	42	0·65	2·24
Miles	1·43	45	1·04	4·59
Stanthorpe	1·68	57	3·87	3·80
Toowoomba ..	2·54	58	2·58	4·96
Warwick	1·65	65	0·61	3·53
Maranoa.				
Roma	1·33	56	2·67	5·84
State Farms, &c.				
Bungeworgorai ..	1·28	16	2·02	6·42
Gatton College ..	1·80	31	2·71	4·37
Gindie	1·25	31	0·40	2·05
Hermitage	1·36	24	..	3·44
Kairi	4·28	16	0.12	0·90
Mackay Sugar Experiment Station ..	5·26	33	1·14	15·45
Warren	1·84	15	..	9·36

GEORGE G. BOND, Divisional Meteorologist

PLATE 77.—THE NARROWS AND MOUNT LARCOMBE, NEAR GLADSTONE, QUEENSLAND.

RURAL LIFE IN OTHER LANDS—XIII.

By the EDITOR.*

RAMBLES IN RURAL ENGLAND.

THESE notes are in the nature of a very brief review of experiences, impressions, and some observations gathered in the course of an unforgettable tour through some of the stock-raising and agricultural counties of England. The object of the tour was to continue a study, at first hand, of the principles, practice, and progress of pedigreed stock-breeding in the United Kingdom, as well as to observe British methods of general farming.

Though there was no lagging by the way, plenty of time was taken for careful observation and the sifting and assimilation of noteworthy facts. Each breeder visited was met amid his own herd or flock and his stock studied at close quarters on their home pastures.

While the tour was, primarily, one of observation and inquiry, one's happy experience was the meeting with farmers of the Old Land socially, as well as otherwise, and the resultant mutual removal of many misconceptions regarding personality, climate, stock breeding and rearing methods, and farming practice of our respective countries.

The Charm of the Old Land.

The good will and hospitality of English people encountered daily made one's comings and goings in beautiful rural England extremely pleasurable as well as profitable.

Perhaps one of the most useful experiences, apart from those of technical value to one hitherto unfavoured, was what one might call the ''discovery'' of England. Early impressions are gathered, as we all know, from what we read and hear. One had heard, for instance, that England was just a little wet island poked away somewhere up in the North Sea. England can be wet and England can be cold. England can also be warm and sunny and the year I spent there was one of a wonderful summer. It was a year in which one saw the splendid procession of the seasons, the clear definition of the one merging into the other; Nature's reawakening in the spring after her long sleep through the snows of winter, her arraying herself in the raiment of a glorious summer, and then the golden autumn and her triumphant progress through the time of harvest—a harvest that ripened that year into a generous fulfilment—to rest once more after the labour of her reign.

That year one was able to feel the charm of the Old Country in every seasonal mood, in the Cornish Riviera as well as on the bleak uplands of Northumberland; on the Sussex Downs and Surrey Hills as well as in the wolds of Yorkshire and the dales of Durham, and one learnt to appreciate profoundly the depth of the Englishman's love of England, equalling, perhaps, that of the Australian's love of Australia.

That year one was to meet for the first time, perhaps, the country Englishman of every social grade—the old time lord of the manor, now giving place to men of a new regime, and whose passing is not entirely unregretted by those who appreciate the part he has played in building up British agriculture; then there was the yeoman; and lastly the farm labourer, usually a very good man at his job. Their generous hospitality, friendliness, straight-forwardness, and all-round fine character made our temporary association, for us, one of the utmost pleasure.

Through Lincolnshire.

Our first halt was at an exceptionally well-managed property of 1,000 acres about 2 miles from the city of Lincoln. There was seen a noted herd of Lincoln Reds, a very fine breed of cattle already well known in Queensland. It seemed, however, that the breeder had to some extent sacrificed body in order to maintain his herd's milking characteristics. All had been bred true to colour and type, and, of the females, over 50 per cent. were 1,000-gallon cows.

After some time visiting places of historical interest and some famous industrial plants in and around the city of Lincoln, steps were turned northward through Market Rasen, Brocklesby, Coxhill Ferry, and across the Humber to Hull, where one had an opportunity of seeing something of the commercial greatness and the shipping facilities of that important seaport. It was interesting to learn that Australian wool is now conveyed through Hull direct to Bradford and other manufacturing

* In a Radio Talk from 4QG.

centres by water, and that, generally, docking and shipping facilities had been designed towards stimulating oversea Dominion trade.

The way through Lincolnshire provided many delightful scenes in a typically English countryside. There were many views of level lands well cultivated; of hills and dales interspersed with woods and fields of richest green. Shorthorns as well as the county breeds were running on many pastures.

In Yorkshire.

Continuing northward from Hull, Leconfield was visited. There mixed farming, of which the breeding of the famous Lincoln sheep was the main feature, was followed. The flocks were distinguished by big frames carrying heavy wool and would be a picture and a delight to the classer, freezer, and fancier. The rams for growth, conformation, and constitution were fit to be shown anywhere.

Two-year-old stud rams clipped, one was informed, an average of 30 lb. at the previous shearing. The ewes were true to type, well-grown and well-culled. The lambs were well-covered and, as a result of scientific feeding, lambing returns showed a remarkably high percentage. Altogether the outstanding qualities of Lincolns and Leicesters were very evident, the breeders' efforts being directed to meeting the requirements of the South American market for stud sheep.

On one farm one point in rearing calves, all fashionably bred of course, was especially noted. The breeder had made it a practice to keep in three cows in full milk, and on each of these cows three calves were reared. This was claimed to be a profitable plan from the point of view of the stud breeder catering for a strong oversea demand for his yearly crop of calves.

Horses, like every other animal on these holdings, showed blood. Shires were favoured in the heavy class and the two-year-olds and yearlings, all fashionably fathered, showed quality in every feature.

Pig-breeding was only a side line with some farmers but great care, so characteristic of English stock management, was extended also to this branch. Berkshire-British Black was the favoured cross and the progeny, as shown on farm records, proved most profitable at prices that, to the Australian, would seem only possible in the pig-raisers' paradise. Of the 640 acres in one farm seven-tenths were under fodders and cereals, and the balance laid down to pasture. The carrying capacity was rather more than an animal to the acre—a triumph, surely, of good farming. The improvements were modern. Seventeen hands were employed on the place and every labour-saving device, both in machinery and farm lay-out, from easy gate fastenings to motor tractor, was used.

This farm showed, further, that social amenities need not be sacrificed for a life on the land. The homestead, tree-embowered, ivy-clad, and set in velvety lawns proved also a centre of hospitality—genial, generous, and genuine—an impressive characteristic of so many homes in rural England.

Near Driffield, in the East Riding of Yorkshire, one was to meet with a hearty welcome from an enthusiastic Leicester flockmaster. In his sheds every beam and partition was adorned with prize certificates of every important agricultural and stock society in the United Kingdom. His sheep were excellent types of an excellent breed. The ordinary flock, noted descendants of Scarborough flocks, showed every characteristic of type more or less marked, but seemed light in shank for their great weight.

It was the practice on this farm to yard lambing ewes at night prior to lambing. They lambed in the yards where each ewe (they were valuable breeders, of course) received individual attention. The ewes and lambs were put on grass, those with two lambs being hand-fed, in addition, on roots. On this and other farms visited the usual practices necessary where winter conditions are rigorous were followed. Housing and hand-feeding were naturally included in the annual routine. What impressed one forcibly was the utmost care and attention given to the live stock generally. Farm animals, particularly sows, were given individual attention during their hours of trouble.

Our more genial climatic conditions in Queensland make it unnecessary at the moment to go into detail in regard to this aspect of English stock-raising practice. The careful and scientific feeding of stock was, however, an outstanding feature and, in this connection, I heard breeders both in England and Scotland, declare again and again that half the breeding of an animal goes down its neck. What struck one particularly was the immense carrying capacity of these English farms. On this holding of 1,100 acres were carried 1,100 sheep and 150 head of cattle. Of that area 800 acres were under the plough or in fallow. The farm was self-contained and the rotation usually followed was:—Seeds, wheat, barley, and manure; then roots, oats, seeds, top-dress.

In a wonderful old-world garden the preparation of soil scientifically was demonstrated and in an adjacent hothouse one found a home reminder in a healthy Australian blue-gum sapling strongly scented.

A Stock Farm in Durham.

At another place in Durham, Shorthorn cattle held pride of place, followed by Leicester and Oxford Downs sheep. This breeder's stock held an unbeaten record and many are numbered among Herd Book classics. His exports of both cattle and sheep to Canada and Australia have sustained that record, and their progeny are known in the principal show rings of both Dominions. The best cattle families in the United Kingdom were represented in the herd, though the Scottish blood predominated. Booth and Duthie blood was particularly noticeable, and the bulls looked equal to surviving any critical test. The youngsters particularly showed strongly every point of their breed and it was noticed that yearlings were still sucking. One already sold for 2,000 guineas was still drawing nourishment from its mother. The principle followed in this respect is that calves (that is for stud animals) should be allowed to suck while they will. The chief herd bull was a magnificent white of the "Myrtle" family, a particularly fine animal and his stock was in great demand. All the bulls, in fact, would arouse any stockman's enthusiasm. One animal had been sold as a yearling to a New South Wales buyer for 1,000 guineas. Another 15-months-old animal seen had already been sold to America for 2,000 guineas, while the whole herd had produced a long line of champions and 2,700 prize winners. On this farm were seen some of the finest stock, judging by show records, in Britain—good coloured typical Shorthorns built close to the ground and perfect in top and under lines. This breeder believed in family variety, and generally retained two animals or more of each family in order to keep the continuity of each in his herd. Fresh infusions were drawn largely from the famous Collynie Stud at Aberdeen.

Running calves with their mothers was not practised by this breeder. They were kept away from the cows except at feeding times, when they were allowed to obtain nourishment from their mothers or foster mothers. If the calves did not take all the milk, the cows were stripped to secure an even milk flow and retain their shape of show. The cattle were not rationed, but a sufficiency of artificial food—crushed oats and linseed cake—was always available. This breeder regarded milk as the cheapest food, for no labour is required in its feeding, and his idea as a stud breeder, of course, was that calf-rearing is more profitable than dairying. He aimed to rear five calves on a single cow, regarding this as possible. That, he told me, was a long way better than bucket-feeding, and the youngsters never go back in steady development.

He never picked his animals until they were seven or eight months old, for his experience was that the youngsters' critical period, or the time when their good points are not likely to be evident plainly, is from three to eight months.

A small flock of Leicester sheep on this place also aroused admiration. Strong in bone, they bore their very great weight somewhat better than those previously seen.

Here again was an object lesson in sound farm management and practice. Every acre of the 230 comprising the holding was returning a profit. Prosperity was evident and all the comfort of an English yeoman's home was apparent. Economy was the keynote. To each member of the household had been allotted the care of a particular department. Pigs and poultry, though sidelines only, also received as much care relatively as the pedigreed cattle.

[TO BE CONTINUED.]

INCUBATION.

By P. RUMBALL, Poultry Instructor.

SEASON TO INCUBATE.

This is perhaps the first phase that should be considered. Although incubation may be successfully practised throughout the year, the results obtained from the birds hatched is not always satisfactory. About the best months for hatching are July, August, and September. Heavy breeds hatched in June and light breeds in the early part of October will in some people's hands prove satisfactory. Chickens of any variety hatched in February or early in March also thrive, but unfortunately they commence producing during the period of plenty and generally moult at about the same time as birds which have done twelve months heavy lay.

The frequent fault of poultry raisers is to hatch in the latter part of October and sometimes November. Stock hatched then rarely thrive, and also take longer to mature than early hatched birds, with the result that their production period commences with the fall in prices of eggs.

Selecting Eggs for Hatching.

Care in the selection of eggs which are to produce the future layers should be exercised. They need to be selected for (*a*) size, (*b*) shape, (*c*) texture of shell, and (*d*) colour.

Although like does not produce like with any degree of certainty, constant selection along these lines tends to fix the qualities aimed at. Size is undoubtedly an inherited quality and one of the features which has an important bearing on successful poultry raising. Breeding birds should be selected early in life for size of egg, as it is only by this means that a strain of fowls can be built up which will lay a good marketable egg early in their pullet year. Do not be content with just using 2-oz. eggs. Aim at eggs which will average about 26 oz to the dozen. Although shape does not materially affect the value of eggs, a uniform article is desired for marketing. Shape, however, has a certain influence on successful incubation. With incubators, as a general rule, the higher the tray or eggs the greater the heat, therefore, if some plump eggs are set at the same time as rather long thin ones the hatching would be irregular owing to the greater heat received by the roundish eggs, they being higher on the tray. Texture of shell varies considerably with the feeding and general conditions of the stock, but it is also possible for this feature to be hereditary. Apart from this, uniform shell structure makes for improved hatches. Colour is not an important feature in Queensland in regard to sales, but from light breeds white-shelled eggs should be produced, tinted eggs being an indication of impurity of breed.

Keeping Eggs for Hatching.

Eggs for hatching purposes should not be kept for a longer period than ten days. If they were set when five days old better results could be expected than when ten days old. It is, however, necessary to keep them sometimes longer than five days and sometimes even longer than ten, therefore they need to be kept under the best of conditions. A uniform cool temperature is desirable, slightly under 60 degrees if possible. The room where they are stored should be dry and not moist. Although fresh air is desirable, direct currents with their drying effect are detrimental to good results. They may be stored on racks or in straw board filters. Where any numbers are to be kept they could be held in egg cases similar to those used for market purposse. The turning of them daily is essential when they are to be retained for any time. This is a simple matter if stored in cases, it being merely necessary to turn the case one side one day and the other the next.

Period of Incubation.—Hen eggs 21 days, English ducks 28, Muscovy ducks 34 to 35, geese 28 to 30, and turkey 30.

METHODS OF INCUBATION.

Incubation may be practised either by natural or artificial means. The necessity of having birds hatched at the most remunerative period and the constant improvement in our commercial breeds of poultry makes it increasingly difficult for the poultry raiser who desired to keep a 100 or so good laying hens to use the broody hen.

Natural Incubation.

The Sitting Hen.—Generally, when the hen is used for incubation she finds her own nest. The best plan is to allow her to continue using it, merely protecting her from rough weather. Her eggs, however, should be removed and replaced with eggs

which come from the best of your stock. As she is expected to remain on the nest for a period of three weeks and will not make full use of dust baths, she should have a good dusting with some insect powder to destroy any lice. She should also have another dusting a few days before the chickens are due.

Red mite are possibly one of the most common and irritating parasites which trouble poultry. They multiply very rapidly when unchecked, and a sharp lookout should be kept for their presence, for if allowed to infest a broody hen the irritation will often cause her to leave her nest. Scaly leg is also a condition which is undesirable in the broody hen. The number of eggs to be used will naturally vary according to the size of the hen. The hen turns the eggs under her at frequent intervals, and when there are too many for her to cover properly those that get on to the outside of the nest will become chilled, resulting in the destruction of the embryo. The hen should be fed exclusively on a grain ration and have plenty of grit and water available. The best results will then be obtained by leaving her as much as possible to herself after giving attention to the foregoing particulars.

Artificial Incubation.

There are many reliable makes of incubators on the market which are sold with instructions for working. These instructions should be followed by the operator as they are prepared after tests made by the manufacturer. There are, however, features which apply in a general way to most makes.

Location of an Incubator.

The incubator should be set up in a room in which there is as little variation in temperatures as possible. If a special room is to be built it should have two roofs with a space of 5 inches or 6 inches between them. The outer overhanging several feet on all sides. This is better than a good ceiling as it allows of a constant current of air and at the same time keeps the direct rays of the sun off the walls. Ventilation should be provided by windows in the walls and vents in the inner roof. These can be operated according to the number of machines working in the room and the outside temperatures. Direct drafts, however, should be avoided. Where it is not desired to go to the expense of building a special incubator room, an enclosure can be made under the majority of the dwelling houses in Queensland. If it is situated under the centre of the house it is well protected from the sun, and the temperatures are therefore fairly uniform.

Heating of Incubator.

The majority of incubators are heated by kerosene lamps. The lamp should always be thoroughly cleaned, the burner boiled in soda water, and new wicks used for every hatch. In starting do so gradually. If a large flame is used for a start with the idea of heating the machine quickly it frequently leads to the smoking of the lamp. A good grade oil should always be used, and in adjusting the flame turn a little higher than required and then reduce to the desired height. This ensures that there will be no running up of the wick.

The lamp should be cleaned and filled early in the afternoon. By doing this all char of the wick is removed, giving greater heat during the cold night and at the same time it gives the operator the opportunity of making sure that the lamps are correctly adjusted before retiring for the night. Do not trim the wick with scissors, use a match to rub off the charred crust, and thoroughly clean the hands before handling eggs, otherwise the eggs may become smeared with oil with the resulting injury to the growing embryo.

Beginning of Hatch.

Heat up the machine a couple of days before it is desired to set eggs, and after the machine is thoroughly warmed up commence to adjust the regulator until the temperature remains steadily at 102 degrees Fahr. with the bulb of the thermometer on a level with the top of the eggs. When the operator is sure that the regulator is correct the eggs can be set. This is better done in the morning so that the eggs will become warm and the machine again regulated before retiring. When the eggs are placed in the machine the temperature will drop, but the regulator should not be interfered with. All subsequent regulation should be done by the adjustment of the flame. Do not place too much work on any system of regulations; it has its limit of capacity to adjust temperature.

Thermometers.

All thermometers should be tested at convenient intervals. This can be done by any person having a clinical thermometer by placing the clinical and incubator thermometers in a basin of warm water gradually increasing the temperature until the clinical thermometer registers 102 degrees and observe the temperature of the incubator thermometer. If the latter registers a degree or so either way, allowance should be made by the operator for this discrepancy. Incorrect thermometers have been responsible for many poor hatches, and even though a new machine is just purchased do not take it for granted that the thermometers supplied are correct.

Temperature.

Temperatures are controlled by capsules or thermostat. Occasionally these get out of order by the former leaking and losing some of the liquid content or by the latter becoming bent. These should be examined particularly when regular temperatures cannot be maintained to ascertain if they are in correct working order. The temperature should stand at 102 to 102½ during the hatch when the bulb of the thermometer is hung as previously stated. During the latter period of the hatch (the last two days) the temperature may run up to as high as 104 degrees. This need not worry the operator as it is caused by the additional animal heat from the live embryo.

Turning.

Begin turning the eggs at about forty-eight hours after setting, and continue to do so twice per day until the nineteenth day unless the eggs are starting to pip. When the eggs are placed in an incubator tray, they should be placed on an angle of about 45 degrees large end up. To turn these it is necessary to handle every individual egg, but after testing and the infertile eggs are removed, they can easily be gently rolled around with the hand. A complete turn is not necessary, it being sufficient only to alter the position of the egg to prevent the germ sticking to the inner lining of the shell.

Cooling.

The cooling of the eggs is merely another method of giving the eggs a thorough airing with the consequent strengthening of the embryo. The necessity of airing varies with the make of the machine owing to the variation in the supply of ventilation. It is, however, important to remember that for the first seven days very little airing is required. The time taken in turning the eggs from the third to seventh day is usually enough airing. After this period the eggs can be kept out of the machine until all burning heat has left them. The period necessary will vary according to the length of time the eggs have been in the incubator, but after returning the eggs to the machine the temperature should have reached the desired height within an hour. In airing, place the tray of eggs on a table. Do not allow a portion of the tray to overhang, otherwise some may become chilled owing to the greater circulation of air. Airing should be practised up until the nineteenth day, but if eggs are then chipping they should not be aired.

Testing.

This should be done on the seventh day. It can be done at an earlier stage but the time necessary to do this work may result in chilling, and also the germ is not so easily distinguished particularly in dark-shelled eggs as on the seventh day. All infertile eggs and dead germs can now be removed. To test, a piece of cardboard having a hole in it similar in shape to that of an egg but a trifle smaller should be held between a lamp and the egg to be tested. An infertile egg will be perfectly clear, a fertile egg will have a dark movable spot about the size of the head of a match with numerous blood vessels radiating from it, while a dead germ will show as a blood ring or streak and generally stationary.

Ventilation and Moisture.

These are both interlocked. If a machine has a rapid circulation of air through it, it will require more moisture than a machine in which the circulation of air is slow. The reason why moisture is supplied is to prevent a too rapid evaporation of the moisture content of the egg. Undue evaporation of the egg content is detrimental to good hatches and to correct development of the embryo. Enlargement of the

air cell naturally takes place due to evaporation of the moisture content and the escape of carbon dioxide through the shell. This enlargement can easily be judged when testing, and if too great restrict the air circulation or increase the moisture content of the air. Many machines are supplied with moisture trays. These trays should be filled from the first of the hatch and refilled at frequent intervals. Where moisture trays are not supplied the air which passes into the machine is charged with a certain amount of moisture. To charge the air with moisture for this variety of machine the floor should be well wetted daily. Good ventilation is equally essential for the growth of the chicken within the egg as it is for the development of the chick when hatched. Without oxygen the changing of the egg content into a lusty chicken is impossible. If a fertile egg is examined on the seventh day a network of blood vessels can be seen near the shell and near the air cell. The blood stream not only converts the food into the embyro but it carries off the waste product (carbon dioxide), and without a good circulation of air this poisonous gas is not removed sufficiently fast, and consequently has a weakening effect on the developing embryo. It will be understood that the more advanced the embyro is the greater is the need of oxygen and the greater will be the amount of carbon dioxide given off; therefore, what will be the correct ventilation for eggs, say, a week old will not suffice when the eggs are in the third week of development. The increasing of the ventilation at this period will also assist in the regulation of the temperature of the incubator. Again, when the chicks hatch the ventilation should be increased, and if the chicks still pant the door of the machine could be slightly open and fixed in that position.

The Hatch.

After the last turning, on the nineteenth day, close the incubator and do not disturb it until the hatch is over. When the chicks have dried off give all the ventilation possible, darken the doors to prevent them picking at droppings or the toes on one another. It is as well to let them remain under this condition for about twenty-four hours, when they should be removed to the brooder. In doing so take every precaution to prevent them being chilled, as chills at this stage would prove disastrous.

Disinfection.

Immediately the chickens have been removed from the machine it should be thoroughly cleansed and disinfected. A good disinfectant is formalin. Any other good coal tar disinfectant may be used. The machine should then be closed up for a while to induce the fumes to penetrate every crack and corner, then allowed to dry and aired thoroughly before being used again.

RICE FOR POULTRY—SOME FEEDING EXPERIMENTS.

A five months' test of feeding paddy rice to poultry has just been concluded at the Government Poultry Farm, Seven Hills, New South Wales. Three groups, each of thirty White Leghorns as even as possible as regards age, condition, and general conformation, were fed for the evening ration as follows:—No. 1 Group, all rice; No. 2 Group, 50 per cent. rice and 50 per cent. wheat and maize in the proportion of two of wheat to one of maize; No. 3 Group, 75 per cent. wheat and 25 per cent. maize.

While the experiment could not be continued long enough for conclusive results to be obtained, the indications were that no harmful results followed feeding rice to the extent of 50 per cent. of the evening grain ration, and that the feeding of all rice for the evening feed had no ill effects on the health of the birds, though egg production suffered to some extent. The actual figures for the three groups for the five months of the test were:—All rice pens, 2,093 eggs; 50 per cent. rice pens, 2,322 eggs; wheat and maize (check) pens, 2,390 eggs.

Commenting on the results, the New South Wales State Poultry Expert writes that rice appears a fairly safe substitute at times of high feed costs, though at the present time all supplies have been used. Only a limited quantity of rice is likely to be sold as stock food, though larger supplies are likely to be available towards the end of the year.

MORTALITY IN YOUNG PIGS.

By E. J. SHELTON, Senior Instructor in Pig Raising.

The use of crossbred or mongrel boars and of breeding sows indiscriminately selected without any reference to their capacity to breed healthy, well-developed stock, is referred to fully in the following reply to an inquiry relative to a farmer who had suffered considerable losses from pigs dead at birth or born too weak to survive, and from sows that failed to breed or if they bred failed to make a satisfactory job of rearing their litters. The reply being of general interest is published in full.

It is evident that the breeding of your pigs is largely at fault. We do not recommend the use of crossbred boars at all at any time, for the results are invariably unsatisfactory, particularly where the boar and sows are closely related; especially is this the case where records of breeding are not kept and where the business is carried on on other than up-to-date lines. At any rate, there would be every possible advantage in culling your crossbred boar and replacing him with an animal of up-to-date type from a reliable stud. If we can assist you in securing quotations or in selecting a suitable boar, we shall be only too pleased to do so on receipt of your advice. We think that you would be well advised to cull the sows also, for they have evidently weakened as a result of the severe climatic conditions recently experienced in your district.

Possibly the feeding of your stock may be at fault, consequently in any treatment recommended we would suggest a change of food, and that attention be given to improving the quality and possibly the quantity of food used.

Faulty Feeding.

We have no record of green bananas having caused trouble with breeding sows, but would not recommend that the bananas be given too freely at any time. It would be better to allow them to ripen somewhat before use and give them in conjunction with concentrated feeding stuff. Perhaps some of the pumpkins may have decayed and possibly the skim-milk tank may be in a filthy condition, carrying a coating of decaying protein matter that is poisonous and likely to cause severe trouble, particularly among breeding sows close to farrowing. Then, again, the sows may have been chased by a dog and may have been injured internally by jumping over logs or crushing one another in an attempt to rush through a narrow gateway. We have no record of the milk from cows inoculated for redwater having caused trouble among pigs and do not think this is a likely cause. We presume there are no poisonous weeds about the pig paddock that will be likely to cause trouble, though now and then we have records of "ergotised" grasses and crops causing trouble. Ergotised rye has, on numerous occasions, been reported as a probable cause of abortion in stock.

Pigs Dead at Birth.

It is evident this trouble is entirely due to faulty diet and to improper handling of the sow.

It is quite unnatural for a breeding sow to produce dead pigs at birth and there must be a cause for this trouble, hence we look to faulty feeding as the most probable cause. Many sows, for instance, receive no other food than skim milk, and this is often diluted with water. This ration is quite unsuitable and inadequate. Skim milk should never be diluted with water, for its feeding value is certainly not increased, and the feeding of a large quantity of weak swill only creates digestive disorders and leads to an intense craving for bulky foods.

Many sows are compelled to run in a bare yard in which there is no grass or succulent herbage, nor any suitable mineral matters (lime, phosphates, and other bone-forming materials). Again, other sows are turned out into lucerne paddocks and have no concentrated (heat and energy-producing) foods; and in other instances, though there is good variety in the ration, the sow is unable to provide the necessary sustenance for her young owing to a lack of vitamins.

The various Departments of Agriculture publish a number of valuable pamphlets on the breeding and feeding of pigs, which may be procured by writing to the Department at any time.

In a general way it does not pay to retain sows as breeders that fail to give satisfactory results; it is quicker and better to cull them and introduce better and more reliable strains.

Good reliable breeding stock can be purchased almost anywhere in the pig-raising districts throughout Australia at prices well within the reach of farmers, and no attempt should be made to continue on with unprofitable stock while better stock can be procured at these rates. The old rule of "Do it now" is well worth serious consideration.

THE MILKING MACHINE—THE CUP AS "HEART AND BRAIN."

A writer in the ''New Zealand Exporter'' states that what a large number of farmers fail to realise is that the cup is the heart and brain of the plant; it is, in fact, the milking machine, and on it alone depends the success or failure of the plant.

The writer considers that the use of cups fitted with air admission mouthpieces should be made compulsory.

Metal mouthpieces, he says, can be fitted to almost any standard make of cup, and the air admission can be put in by the farmer himself. Only a pinprick is required, and can be made by driving the point of a darning needle through the side of the mouthpiece, or by the use of a fine watchmaker's drill.

The effect of this is to cause a small rush of air down the cup, driving the milk clean away from the teat as it is drawn out, and also, it practically releases all pressure in the teat between pulsations. When the cups are removed the teats will be found soft, dry, and in their natural colour.

With this form of cup the pressure must be raised to 17 lb. to the inch, and cups with air admission, working at as high as 19 lb., are far and away easier on the cow than ordinary cups working at 13 lb. or 14 lb.

Air admission cups will not hang on the average cow of their own accord. During the period when the pressure is released they will fall off unless supported on a stool or hung to an overhead wire.

Many dairymen boast of the fact that their cups never fall off, but did they know the extra strain imposed on their cows by this type of cup, and the extra necessary amount of stripping they have to do, they would in most instances go to the little extra trouble entailed in supporting the cups.

Another very important point is to remove the cups immediately the flow of milk ceases. To leave the cups dragging away at empty teats is simply asking for trouble, and trouble in plenty will follow.

Inflations should be changed at the least three times a season, and tightened once every month or six weeks. Trying to make stretched half-rotten inflations last out another month is the very worst type of false economy, especially towards the end of the season.

It should always be borne in mind that the more milk a cow gives out the bigger her flow, the more efficient the cups have to be to handle their job. Any old ''half-pie'' machine will milk heifers or poor cows, but after the second or third calving some of these animals will start holding up their milk. Generally the farmer will blame the cow, whereas ninety-nine times out of a hundred the fault lies in his cups.

Through the milk not being taken freely from the teat the lacteal passages in the udder become numbed and the flow of milk ceases. If stripping be prolonged for a minute or so the numbness wears off and the milk comes away again. If this sort of thing continues for long the cow will develop the habit of holding up her milk, and it will take a good machine and a very patient operator to break her of it.

There are odd cases where, owing to some peculiarity of the udder, numbness will be cured by the squeezing tendency of the mouthpiece, in which case a different shaped cup may be tried with good results.

There is some difference of opinion as to whether the air inlet in the claw should be retained along with the air admission mouthpiece. Personally, I do not think it matters greatly one way or the other, but for safety's sake would advise that both be used.

Pulsator speed should be absolutely regular if possible, with no variation from the beginning until the end of the season. With heavy milkers it is better to err on the slow side, for forty to forty-two pulsations a minute being most satisfactory.

The time some farmers take to put through their herds is scandalous. I have heard of three milkers taking two and a-half to three hours to milk sixty cows, using a four-cow plant. The writer with one youthful assistant has put through seventy-five cows in one hour thirty minutes, engine running time, and no skimping the job at that!

If we get over three gallons of strippings off the lot we go looking for the reason, and it is never hard to find. Air holes blocked, inflation slack or engine gaining speed—one of these three will generally be found to be the cause of the extra strippings.

THE BUSINESS OF DAIRYING—A FARMER'S VIEW.

"Dairy farming to-day is a business, and to be successful the farmer has to conduct his operations on business lines." With the foregoing as preface, Mr. A. S. Pankhurst, of Singleton, New South Wales, at a recent Agricultural Bureau conference, drew attention to what experience had impressed him as some of the most important points.

The holding having been acquired, the site for the farm buildings should be chosen. It was commonly believed that small holdings were essential, and it was safe to assume that half a mile from grazing to milking bails was a maximum. The cow was one of nature's machines for distilling milk—not a working bullock—and excessive travelling lessened the milk yield, and probably the cream yield also. However, by judicious placing of the buildings on flat land it was possible to occupy 1,000 acres as one dairy; the area should be split across each way to make four 250-acre paddocks, and the buildings placed centrally, with access to each paddock.

In hilly country it was unwise to build the bails at the top of the hill. Cows grazed up hill, and used less energy when driven down hill to the bails than up hill, and exhausted cows did not give all their milk.

It was not always advisable to place the buildings in the most convenient position in relation to the road, as was sometimes done. They should be located in the position most convenient for the cows, even if not convenient to the road.

The matter of breeds was too big to be discussed in the time available, but really did not matter so long as testing and improvement were carried out. Cows were only given by nature sufficient milk to rear their young, and there was always a tendency to throw back. To maintain the present standard of development and to improve it, testing and selection were essential.

To a young man starting, Mr. Pankhurst offered the advice "breed your own heifers," and rear them only from cows of high production capacity. Select the sire as well as the dam from high-producing families, caring also for constitution. High production as well as other things seemed to go in families.

He had had experience with a strain that had always shown six teats; four were enough, and the two extra were superfluous, and were troublesome to dry off. He had snipped them off with distinct advantage, and had never known an animal to get a hard lump in the udder as a consequence.

Discussing the age at which to breed, Mr. Pankhurst said that quality of country affected development. If, under normal conditions, the animals were allowed to go to three and a-half years before breeding, a magnificently developed animal resulted, but there was a tendency to throw towards beef, especially if carried on for several generations. His experience had been that the best age to breed was at two years of age or a little under.

"Feed heavily," the speaker advised. "You must put in to take out, and do not dry the cows off too early." It was wise to get them into the habit of long lactation periods early in their lives. He was not in favour of never drying off, as was practised by some, for it weakened the calf.

When the heifers came in, it was not wise always to assume that, because they were of a good strain, they would be good producers. In these days there was no room for "boarders" on the dairy farm, and the only way to detect them was to join up with a herd-testing unit and test every heifer.

Discussing some aspects of general management, Mr. Pankhurst said he had always found it better to take the "raw edge" off the cows' appetites before putting them on to lucerne, but if that was not possible he had prevented "bloat" by cutting the lucerne twenty-four hours ahead of feeding, and stacking, tramping, and sweating to get rid of the gas. The cows should be fed as soon as they were turned out of the bails. He had experimented and found that by waiting an hour and a-half before feeding the yield was 2 or 3 gallons less out of a total of 200 gallons. In winter the cows had to lie down and wait, cold and empty, and even in summer time was lost, while later in the day the dew was off the grass and the sun was hotter.

The highly-developed modern cow was a lazy animal and wanted lazy conditions. Unless a cow came to its full potential production within four weeks of calving it had been his experience that she never would get to it. The cows should be fed well when they first came in and before they calved, so that they could store supplies for subsequent milk production.

THE ROYAL SOCIETY OF QUEENSLAND.

The Ordinary Monthly Meeting was held in the Geology Lecture Theatre of the University on Monday, 28th April. Dr. Herbert was in the chair, and about twenty-five members were present. The following were proposed for ordinary membership:—Messrs. E. A. O'Connor, M.Sc., and M. White, M.Sc., proposed by Dr. Jones and Mr. Perkins; Dr. W. H. Steel, proposed by Mr. Perkins and Prof. Lowson. Misses F. E. Scott and E. M. Ferricks were proposed for associate membership by Messrs. Perkins and Cayzer. Messrs. A. J. Stoney, B.E.E., and E. M Shepherd and Dr. J. M. Roe were unanimously elected ordinary members of the Society.

Mr. H. A. Longman exhibited two somewhat abraded otoliths of a freshwater catfish, *Tandanus* sp., which had been found in alluvium at Lakes Creek, Rockhampton, by Mr. F. Jardine, who had sent them to the Queensland Museum. Generic identification was established by direct comparison with otoliths or ''ear-stones'' taken from recently captured catfishes.

Dr. E. O. Marks exhibited the anterior half of a stone axe, found near the junction of Ewen Creek and Stanley River, near Peachester. The cutting edge had been fashioned entirely by chipping. All other recorded stone axes from Queensland have been formed by grinding. This exhibit was commented on by Mr. Longman.

Dr. W. H. Bryan read extracts from a paper by E. C. Tommerup, B.Sc., A.A.C., entitled ''A Geological Reconnaissance of the Linville-Nanango District.''

This paper deals with the geology of a large area situated between Linville and Nanango, Queensland, the information being gathered during numerous journeys made by the writer while engaged in making traverses of the district as an officer of the Queensland Forest Service.

The writer has attempted to correlate and classify the various rock formations of the district, but does not regard the classification as either complete or final.

The oldest rocks in the area are representatives of the Brisbane Schists which occur between Yarraman and Wondai. Next in succession (between Yarraman and Esk) there are several outcrops of slates which probably belong to the Gympie Series. Whether these were deposited *in situ* or were faulted into their present positions is not clear.

These were followed by the Andesitic Stage of the Esk Series, which is typically developed near Marbletop, east of Nanango. The writer was able to follow the massive andesites and andesitic agglomerates of this stage from Goomeri to the head of the Brisbane River and beyond Mount Stanley at least as far as the junction of Avoca Creek with the Brisbane River.

The overlying Shale Stage of the Esk Series was examined by the writer at a number of different localities within the area described, among them being Upper Yarraman Creek, where a small seam of coal is included in the section. Many of the conglomerates associated with the shales contain numerous pebbles of milky quartz, jaspers, and other representatives of the Brisbane Schists, together with others, derived apparently from the Gympie Slates.

The igneous rocks of the area fall naturally into three groups—viz.: (*a*) Granodiorites, (*b*) Porphyrites, (*c*) Basalts. The granodiorites are younger than the Gympie Series, which they intrude, but are older than the overlying Esk Series. The age of the porphyrite intrusions is not clear. They are apparently closely associated with the granodiorites, although they are probably somewhat older. On the other hand, they may possibly prove to be related to the Andesitic Stage, which is restricted to the eastern part of the area. The basalts outcrop along the Cooyar Range and elsewhere, and overlie the Shale Stage of the Esk Series.

The paper is illustrated by a sketch-section from Tarong to Taromeo, and by geological and contour sketch maps.

Miss Dorothy Hill, M.Sc., read a paper entitled ''The Development of the Esk Series between Esk and Linville, with Reference to the Possible Occurrence of Workable Coal.''

In the Brisbane Valley, between Esk and Linville, a series of Triassic rocks is trough faulted along the north-westerly grain of the country into the Palæozoic (including Permo-Carboniferous) formations. These Triassic rocks, the Esk Series, are freshwater basin deposits laid down by rapidly changing currents, with intensive contemporaneous volcanic activity. The Lower Esk Series is typified by very intense andesitic activity, with the formation of a great thickness of peculiar andesitic boulder beds, with sedimentary deposits being formed during periods of temporary cessation of volcanic activity. The strictly conformable Upper Esk Series, however, is typified by a thick development of rapidly varying sedimentary deposits, with interbedded flows and tuffs resultant from intermittent trachytic activity. Above the Upper Esk Series the Bundanba sandstones, now all eroded

away except from the southern part of the area west of Esk, were deposited without angular unconformity.

In addition to the trough faulting, the Esk Series has been strongly affected by sharp north-westerly directed anticlinal fracturing, accompanied by the intrusion of an important series of hypabyssal rocks, the Brisbane Valley Porphyrites, closely related in mineralogical type to the flows and tuffs of the period of sedimentation. The time relations of the trough faulting and anticlinal fracturing are unknown, but they both occurred before the extrusion of the Tertiary rhyolites.

The conditions of deposition and the type of folding of the Esk Series do not promise well for the occurrence of a large field of workable coal, but some of the synclinal areas are worth more detailed mapping on the chance of the discovery of a deposit large enough to support a small colliery.

These papers were discussed by Prof. Richards, Drs. Bryan, Whitehouse, and Marks, and Messrs. Denmead, Bennett, and Dunstan.

A paper, ''Essential Oils from the Queensland Flora, Part 1, *Baeckea virgata,*'' by T. G. H. Jones, D.Sc., and M. White, M.Sc., was laid on the table.

1,560 ccs. of oil, representing a yield of .88 per cent., were distilled from 353 lb. of the leaves. The constants recorded for the oil are—

$$[d]_D = +16.5;\ N^{20}_D = 1.4742;\ \text{Acetyl No.} = 41;\ \text{Ester No.} = \text{Nil};\ \text{Density} = .9021.$$

Examination of the oil showed the presence of d α-pinene 50-60 per cent., cineol 30 per cent., with pino-carveol, aromadendrene, and sesquiterpene alcohol in smaller quantities.

Prof. H. C. Richards communicated a short paper, ''A Record of Graptolites from Mount Isa,'' by R. A. Keble.

A sample of fine, thinly-bedded sandstone with some of the laminations completely silicified and showing galena, and with some of the others more or less stained with ferric oxide, was found last summer on a spoil dump at Mount Isa by Mr. J. O'M. Lyons, and was subsequently handed to Mr. R. A. Keble by Mr. E. Broadhurst.

Mr. Keble regards the face of the specimen as showing graptolites preserved either as impressions or as films light-red in colour.

There are about fifty polyparies in all, poorly preserved, but many showing both proximal and distal extremities, and one or two showing thecal details.

They all belong to the Monograptidæ, and, although absolute specific determination is unwise, Mr. Keble has no hesitation in citing *monograptus cf. halli,* Barr and *Monograptus cf. undulatus* E. and W.

On this evidence he regards the age of the Mount Isa beds as being Silurian, and mentions that M. cf. halli occurs in shale approximately 1,000 ft. above the base of the Silurian in Victoria at Jackson's Creek and on the Wood's Point Goldfield. He also regards the European equivalent of the Mount Isa beds as approximately zone 21 near the top of the Llandovery.

Especially since the finding of the Cambrian trilobites at the Templeton River the Mount Isa beds have been regarded very generally as Pre-Cambrian in age. On this account, and owing to the association of ore-bodies of much importance, the determination is of considerable interest.

In communicating the paper Professor Richards summarised the evidence for the existing general idea as to the Pre-Cambrian age of the Mount Isa beds, and especially considered the relationship between these steeply dipping beds and the gently undulating fine grits of Middle Cambrian age at the Templeton River a few miles to the west of Mount Isa.

The results of the traverses made by Messrs. Shepherd and Ridgway, of the Queensland Geological Survey, and of Mr. J. B. Wadley in the same region were considered, and possible interpretations of these in terms of a Silurian age for the steeply inclined Mount Isa beds were put forward.

Considerable discussion took place, and general disagreement with the determination of the specimen as graptolitic in character was expressed by several members, especially Dr. F. W. Whitehouse, Mr. B. Dunstan, and Mr. E. C. Saint-Smith.

The firstnamed considered the specimen organic, but he could not believe it to be a graptolite, particularly a species of *Monograptus.* Messrs. Dunstan and Saint-Smith regarded the specimen as purely inorganic, and pointed out that much search had been made for graptolites and other fossils at Mount Isa, and, although material similar to the specimen under discussion had been seen, the structures were considered to be purely inorganic.

Answers to Correspondents.

BOTANY.

The following answers have been selected from the outgoing mail of the Government Botanist, Mr. C. T. White, F.L.S.:—

Clover *(Desmodium triflorum).*

T.F.D. (Beaudesert)—

Your clover specimen is *Desmodium triflorum,* a species of Tick Trefoil common in many warm countries and of recent years found in Australia. It is probably introduced and seems to be on the increase. In the pastures of coastal Queensland, to which it makes a valuable addition, stock are very fond of it and it is nutritious. The only disadvantage is that it grows so close to the ground. The name Tick Trefoil as applied to species of the genus refers to the pods breaking off and being carried about, thus disseminating the plant.

Fish Weed. Peppercress. Yellow Weed.

A.M.D. (Boonah)—Your specimens are:—

1. *Chenopodium triangulare.*—Fish Weed. A native plant generally looked upon as rather a useful herb in the average mixed native pasture. It gives rather a weedy or somewhat ''fishy'' flavour to milk and butter, hence the vernacular. Apart from this it is a useful plant and makes good hay.
2. *Lepidium ruderale.*—The Peppercress. Gives a strong mustard or turnip flavour to milk, otherwise a useful pasture herb.
3. *Galinsoga parviflora.*—Yellow Weed. Generally looked upon as a useful fodder, especially as green feed for poultry.

Grass *(Chloris virgata).*

E.G.H.C. (Grandchester)—

Your specimen is *Chloris virgata,* a vigorous grass, closely allied to the ordinary Rhodes grass. It is of annual duration, however, and does not seem to compare with the ordinary Rhodes grass as regards palatability. It is moderately common in Queensland and is mostly seen as a stray along railway lines, on the edge of cultivation paddocks, and so forth. It has no advantages over the ordinary Rhodes grass. In fact this latter is generally regarded as far preferable as a fodder.

'Bindy-Eye.''

B. (Brisbane)—

The term ''Bindy-eye'' was originally applied to several plants of the genus *Calotis* on the Darling Downs, particularly to *C. lappulacea, C. scapigera,* and *C. cuneifolia.* These are plants belonging to the large family Compositae and the flower heads die off leaving the ''seeds'' or fruitlets to ripen into burrs. Each little ''seed'' or fruitlet is provided with its own bristles. The name, however, is now applied to quite a number of burr plants in Western Queensland and in Central Queensland about Barcaldine, Longreach, &c.; the term is mostly applied to a tall-growing plant, *Bassia quinquecuspis,* which breaks off at the base and rolls about in the ordinary ''roly-poly'' fashion when ripe. With regard to the spelling of the name this is doubtful. In Angus and Robertson's Encyclopaedia you will find a note under the heading *Calotis* in which it states: '' 'Bindi eye' or 'Bindei'—the spelling is doubtful.''

A Native Orchid.

INQUIRER (Brisbane)—

Your specimen of native arrowroot forwarded represents the pseudo-bulbs of a native orchid, *Cymbidium albuciflorum.* These are sometimes chewed by people in the bush as a cure for diarrhœa and dysentery, and were used in the early days by the aborigines as food. We have nothing to say about the properties of the plants except that the pseudo-bulbs seem rich in starch.

Grass—*Eremochloa bimaculata.*

G.S. (Toowong)—

The specimen has no seed head and it is rather difficult to name it from leaves only. The grass you sent we should say, however, is *Eremochloa bimaculata,* a species fairly common at this time of the year on dry, stony ridges where it provides a certain amount of fodder in such barren places. In addition to the stony country it also grows in sandy lands, such as Bribie Island and Maroochy River. Though comparatively common we have not heard a local name applied to it. If possible it would be as well for you to send a seed head to verify the determination.

Glycine Pea.

J.B.K. (Kilcoy)—

No. 1 is *Glycine tabacina,* the Glycine Pea or Glycine Vine. A very common legume in the general mixed native pasture in Queensland and usually regarded as a very good fodder. Though fairly common we have not heard a common name applied to it, and have adopted the generic name as the local one.

No. 2 is a species of *Desmodium* or Tick Trefoil. The specimen is not in flower but we should say it is *Desmodium triflorum,* a species fairly common in coastal Queensland extending to New Guinea and the Malayan region. Though a native plant it seems to have been on the increase during the last few years. We should say its presence would improve the general value of the pasture.

Barb Wire Grass.

J. H. McC. (Dalby)—

Your specimen is *Andropogon refractus,* commonly known as Barbed Wire Grass on account of the barbed wire-like appearance of the seeding spikelets. The grass grows mostly in fairly dry forest country and provides a certain amount of rather coarse forage.

DAIRYING.

Selected from the outward mail of the Supervisor of Dairying, Mr. Chas. McGrath.

Ropey Milk—Stringy or Curdled Milk.

C.J.C. (Montrose)—

Ropey milk is caused by bacteria which find their way into milk from various sources and are hard to eradicate. The specific micro-organisms consume the sugar of milk, using it to construct large slime capsules around their cells.

One of the sources is stagnant water, and cows which are allowed to wade therein often produce ropey milk. Should there be cause to suspect this source of infection the cows should be prevented from having access to the water, and their flanks and udders should be washed with a suitable disinfectant.

Some diseases of the udders of cows are a source of infection of the milk. Milk from cows suffering from any abnormal condition of the udder should not be used for human consumption. If there is any indication of udder derangement or ill-health of a cow a sample of the milk should be forwarded for bacteriological examination.

The organisms may be carried into the milk by use of unsterilised utensils, and the milk may in turn infect all other utensils with which it may come in contact. In such cases it will be necessary to sterilise all utensils in use including buckets, strainers, cans, separator parts, &c., by placing them in boiling water for at least ten minutes.

Should a milking machine be in use it will be necessary to thoroughly cleanse and scald each part and then sterilise by passing a suitable disinfectant through it. A suitable disinfectant for the above purpose may be made as follows:—

Stock Solution.—12 oz. chloride of lime in one gallon of water. Keep in a covered glass or stoneware jar until settled.

Solution for Use.—1 oz. of the above solution to three gallons of water.

PIG RAISING.

Replies selected from the outward mail of the Senior Instructor in Pig Raising, Mr. E. J. Shelton, H.D.A.:—

Salt for Pigs. Lung Trouble.

R.J.R. (Monto)—

There is no danger associated with a reasonable use of salt in the feeding of pigs, but an oversupply would be very harmful in much the same way as would be the case if human beings were given an excess of salt in their food. A mixture of charcoal, ashes, salt, bone meal, and lime should be kept before the pigs at all times so that they can use same as they desire.

We would certainly not recommend the heavy dosing of pigs with medicine while they are suffering from lung troubles, but if you can induce them to take a mixture, such as one teaspoonful of turpentine with thirty drops of laudanum in a small quantity of food and then follow on with about two or three times the quantity of food without the mixture, good will result. Turpentine is a stimulant and would be effective in getting rid of internal parasites, worms, &c., for pneumonia is very often exaggerated by the presence of intestinal worms, especially in young pigs.

Pigs affected with worms cough a good deal, this being the result of internal irritation. Pigs are not usually condemned at the bacon factories for pneumonia provided the carcasses are otherwise normal, but badly affected animals in low condition would certainly not pass the inspector.

If you pay additional attention to the feeding of your pigs and keeping them under hygienic conditions, your future losses will be considerably lower.

Open Air Pig Breeding.

A beginner in the pig business asks the following question:—

Can pig-breeding be carried on profitably on the paddock system, using natural grasses as the food, perhaps with a little Sudan or Elephant grass given in during the summer time?

Answer.—No; pig-breeding cannot be carried on successfully on natural grasses. Pigs require ample supplies of succulent, nutritious food, and they must have some grain or concentrated meal in addition. Grasses and fodders such as Sudan grass, lucerne, sorghums, milo, clovers, maize, and Kaffir corn, pumpkins, wheat, oats, barley (as greenstuff), artichokes, and potatoes, all provide suitable green foods, and wheat, oats, barley, peas, maize and grain sorghums are all excellent grain foods. The best summer food is undoubtedly lucerne and clover, but you have a good variety among the crops mentioned to provide a good rotation of crops; these, with a light grain diet and ample supplies of clean cold water, should fill the bill.

Don't forget also that pigs need charcoal, wood ashes, and bone meal in the building up of the bony structure of their bodies, and in addition pigs should be given the opportunity of exercising freely over succulent pastures, where they pick up quite a lot of their living and benefit in the health-giving sunshine.

It certainly does pay to grow as much of the food as can be produced on the farm, and its utilisation right on the spot should be the objective. Concentrated foods used judiciously are a payable proposition too, and in many instances it could be shown that it pays a good deal better to purchase these concentrates than to attempt to grow them. As an instance it does not pay the pig farmer to attempt to grow wheat unless he is resident in a district where wheat can be profitably produced. Similarly there are many districts where it pays better to buy maize than to grow it, also peas, or the meals resultant from the grinding of these grains. Balanced rations should be fed in order to produce the most profitable returns, and these rations must combine all the elements necessary to produce flesh, fat, bone, heat, energy, and the store of fat for future use as required either before or after slaughter.

What is Tankage?

An inquirer of a scientific turn of mind who has been reading up the subject of feeding pigs stumbled across the term "tankage" in quite a lot of the references to protein foods and asks just what tankage is.

In general the term "tankage" is an American one, and indicates that the material referred to has been prepared from residues of meat trimmings and similar materials which, in process of manufacture, are placed in steam pressure tanks where a temperature of around 245 degrees F. is maintained for several hours. This high temperature releases mo: , of the fats which are then drained off and sold under various trade names, after having been suitably prepared. The tankage is then dried to a point where it can be handled and stored for an indefinite period. After going through the drier the tankage is run through a mill (the dessicator) and from there to a grinder and screening machine, and is screened to a proper mechanical condition, in other words to the mechanical texture or degree of fineness of ordinary corn meal. It is usually sold under a guarantee of something like.

Crude protein	50 to 60 per cent. minimum
Moisture	7 to 8 per cent. minimum
Crude fat	8 to 10 per cent. minimum
Crude ash	5 to 10 per cent. minimum

In Australia most of this class of product is sold under the trade name of "Meat Meal" as stock foods regulations do not recognise a term such as tankage which does not indicate the origin of the product. Meat meal resembles tankage in appearance, but some grades carry a protein content lower than that referred to above. In fact the composition of quite a number of packing house or meatwork products varies in accordance with trade guarantees. It should be the regular practice of buyers of these products to study the chemical analyses which always accompanies the delivery per bag, for only in this way can satisfaction be assured.

In a good many instances meat and bone meal are combined and sold as such, and in others blood and bone are combined.

It is worthy of note in passing that under modern methods of manufacture there is no risk of the germs of disease being transmitted to live stock per the use of meat meals, as the products are thoroughly sterilised in treatment and rendered germ free and the high temperature to which they are subject effectively destroys any germs present. Government inspection does not permit any diseased animals or portions thereof being used in the preparation of meals for feeding to live stock, but even if such animals were used, all danger of transmitting these diseases would be overcome by the sterilising processes which this class of material undergoes.

TO NEW SUBSCRIBERS.

New subscribers to the Journal are asked to write their names legibly on their order forms. The best way is to print your surname and full christian names in block letters, so that there shall be no possibility of mistake.

When names are not written plainly it involves much tedious labour and loss of valuable time in checking electoral rolls, directories, and other references. This should be quite unnecessary.

Some new subscribers write their surname only, and this lack of thought leads often to confusion, especially when there are other subscribers of the same surname in the same district.

Everything possible is done to ensure delivery of the Journal, and new subscribers would help us greatly by observing the simple rule suggested, and thus reduce the risk of error in names and postal addresses to a minimum.

General Notes.

Staff Changes and Appointments.

Messrs. R. J. Rollston, J. Macfie, and H. Lambert have been appointed Assistant Inspecting Cane Testers for the forthcoming sugar season, with headquarters at Cairns, Mackay, and Bundaberg, respectively.

Mr. W. Benham, of Byrnestown, Gayndah Line, has been appointed an Honorary Inspector under the Diseases in Plants Act.

Mr. H. W. Chambers, of Westgrove Station, Injune, has been appointed an Officer under the Animals and Birds Acts.

Constable S. Renton, of Yaraka, has been appointed an Inspector of Slaughter-houses.

Mr. R. M. Macdonald, of 151 Miles 65 Chains, Southern and Western Railway, has been appointed an Acting Inspector of Stock.

Mr. K. V. Henderson, Junior Field Assistant, has been appointed Field Assistant, Cotton Section, Department of Agriculture and Stock.

The Officer in Charge of Police at Pomona has been appointed an Acting Inspector of Stock at that place. Mr. H. J. Walker has been appointed an Inspector of Slaughter-houses on probation.

Mr. W. Ellison, Sub-manager, Committee of Direction of Fruit Marketing, Brisbane, has been appointed an Honorary Inspector under the Diseases in Plants Act.

Mr. C. P. Power has been appointed a Temporary Ranger under the Animals and Birds Acts. Messrs. A. Nagle, N. E. Goodchild, R. E. Haseler, E. Widdup, and W. J. White, Officers of the Cotton Section, Department of Agriculture and Stock, have been appointed also Rangers under the Animals and Birds Acts.

The resignation of Mr. J. R. Collier as Inspector of Slaughterhouses, Cairns, has been accepted as from the 12th April, 1930, as tendered.

PIG SCHOOL AT GATTON—ALTERATION OF DATES.

The dates for the School of Instruction for Pig Raisers at the Agricultural College at Gatton chosen originally were 9th to 19th June, but it has now been found necessary, in order to fit in with College arrangements, to rearrange these dates, and those finally decided on are 30th June to 11th July, 1930.

Banana Planting.

The planting policy of the Banana Industry Protection Board for the coming season is based upon the opinion that under existing circumstances the complete eradication of "bunchy top" from the State is not practicable. In dealing with the disease, the aim should be to prevent its spread to those districts which are at present free from infection, and its reduction in areas already infested. In effect, permits for planting during the coming season in that part of Queensland outside the quarantine area declared between the Maroochy River and the main Caloundra-Landsborough road will be issued on the recommendation of the agent, with these restrictions:—No permit shall be issued to the occupier or owner of a neglected or abandoned plantation, nor for planting in proximity to a plantation badly infested with "bunchy top." Within the quarantine area defined as starting from the mouth of the Maroochy River on the north-east, and following the northern bank of the said river to its point of contact with the eastern boundary of State Forest Reserve No. 292; thence directly west to the boundary between the parishes of Maroochy and Kenilworth, following this boundary south to the township of Mapleton; thence continuing south along the main road to Montville; thence along such lastmentioned main road to the main Maleny-Landsborough road, following such lastmentioned main road to Landsborough; thence by the main road from Landsborough to Caloundra; and thence by the Pacific Ocean to the point of commencement, no permits for planting will be issued.

Queensland Wins Australian Cheese Championship.

The following principal awards in the Victorian butter and cheese competitions were announced on 21st May:—

BUTTER (FEDERAL CLASSES).

Australian Championship—

Grafton (New South Wales)	1
Upper Maffra (Victoria)	2
Maffra (Victoria)	3

Sheffield Shield (given by butter merchants of London)—

Bega (New South Wales)	1
Cobden (Victoria)	2
Maleny (Queensland)	3

CHEESE.

Australian Championship—

Cooranga North Dairying Co. (Queensland)	1
Downs Co-operative Co., Unity Brand (Qld.)	2
Moola (New South Wales)	3

World's Poultry Congress—Queensland Representation.

Mr. P. Rumball, Poultry Instructor, left by the "Largs Bay" for England on 20th May. Mr. Rumball has been granted five months' leave of absence by the Department for the purpose of enabling him to attend the Fourth World's Poultry Congress, to be held at the Crystal Palace, London, from 22nd to 30th July, 1930, and the post-Congress tour to be held in connection therewith.

The Department is not directly interested in Mr. Rumball's tour, and accordingly any business transactions which Mr. Rumball may engage upon while away from Queensland will be entirely between him and those who may entrust him with commissions.

The organisation of the Congress is being undertaken by the English Ministry of Agriculture and Fisheries, in conjunction with the Department of Agriculture, Scotland, and the Minister for Agriculture for Northern Ireland. There will be forty-five nations participating in the Congress, and it is expected there will be at least 4,000 delegates from Europe, North America, South America, Africa, Japan, and Australia.

At this Congress, there will be Sessions devoted to papers, an exhibition of poultry, poultry appliances, and the general methods of raising poultry and eggs in different parts of the world. It is anticipated that a special feature will be made of marketing. English will be the official language of the Congress.

After the Congress, the delegates will make a tour of Great Britain and Ireland. The English tours will be planned to show, first, the poultry education and research work conducted by the National Poultry Institute—namely, at Harper Adams Agricultural College, Shropshire, Cambridge University, South Eastern Agricultural College, Kent, Reseheath School of Agriculture, Cheshire, and the Government Veterinary Laboratory, Surrey, as well as the work of other eductional institutions.

In Scotland, visits will be made to the Genetics Department of Edinburgh University, the Rowett Research Institute, Aberdeen, the experimental farm of the North of Scotland College of Agriculture, and the official egg-laying test of the Department of Agriculture for Scotland. There will also be an inspection of commercial poultry farms and plants illustrative of Scottish poultry keeping.

In Ireland, visits will be made to the chief poultry centres, as well as to the Northern Island Poultry Research Station at Hillsborough.

Generally, the whole object of the Congress and subsequent tours is to bring together those concerned with the development of the poultry industry; pooling the best and most recent knowledge concerning the various aspects of the poultry industry in all parts of the world; improving and developing poultry research, education and economics; encouraging, through displays on an international basis of purebred poultry, the improvement of poultry stocks in all countries; and stimulating, through commercial exhibits, trade in all the requirements of the poultry industry.

The Congresses are held triennally, the first being held in Holland in 1921, the second in Spain in 1924, and the third in Canada in 1927, and the fourth in London in 1930.

Australian Thrift.

The Australian life insurance companies, according to last year's official figures, have funds totalling £180,000,000, and have entered into contracts to pay to widows and orphans no less than £320,000,000, on behalf of some 2,000,000 policy-holders. With the added assurance from reversionary bonuses the total to be paid under the abovementioned contracts will exceed £400,000,000 to be paid to people at a time of greatest stress. If one unites with this evidence of Australian thrift the actual savings in the savings banks, which total £216,000,000, and the fact that 60 per cent. of Australian householders are on the way to owning or actually do own their own homes, the stability of the national character of our people is apparent.

Radio Lectures on Rural Topics.

Following is the June list of radio lectures arranged for officers of the Department of Agriculture and Stock, Station 4QG., Australian Broadcasting Company, Limited:—

Monday, 9th June—"Educational Particulars for the Pig Farmer." Mr. L. A. Downey (Instructor in Pig Raising).

Wednesday, 11th June—"Country Topics." Mr. J. F. F. Reid.

Monday, 16th June—"Talk on Dairying." Mr. C. McGrath.

Thursday, 19th June—"Talk on Fruit Culture." Mr. L. J. Freeman.

Monday, 23rd June—"Housing of the Pig." Mr. L. A. Downey (Instructor in Pig Raising).

Thursday, 26th June—"Country Topics." Mr. J. F. F. Reid.

Thursday, 3rd July—"Talk on Sheep and Wool." Arranged by the Department of Agriculture and Stock.

Cheese Board.

An Order in Council has been passed amending the constitution of the Cheese Board. The amendment applies only to the constitution of the Board itself. The amended constitution provides:—

(*a*) That the Cheese Board shall consist of five (5) members elected by growers, together with the Director of Marketing or a Deputy appointed by the Minister.

(*b*) For the purposes of the election Queensland is divided into five districts, with one representative for each division; the electors of each division shall be: (1) Cheese Manufacturers in that division who produce or produced cheese for sale during six (6) months prior to the election, and (2) dairy farmers who during six months prior to the date of election supplied or supply milk to cheese manufacturers operating in that division.

The cheese factories in each division are as follows:—

Division No. 1.—Cooranga North, Daradale, Koondaii, Highgrove, Maclagan (Kulpi), Maclagan, Maclagan North, Rangemore, Yamsion, Malling, Moola, Quinalow, Rosalie, Rosemount, Sunnyvale, and Woodleigh Cheese Factories.

Division No. 2.—Biddeston, Boodua, Gowrie Junction, Hodgson Vale, Jondaryan, Lilyvale, Westbrook, Wyreema, Crosshill, Kelvinhaugh, Kingsthorpe, Wellcamp, and Barnesmore Cheese Factories, and C. M. Hitchcock, Gomorran.

Division No. 3.—Aubigny, Captain's Mountain, Irongate, Kooroongarra, Mount Tyson, Brookstead, Linthorpe, Pittsworth, Scrubby Mountain, Springside, Yarranlea, Rocky Creek, and Yargullen Cheese Factories.

Division No. 4.—Mount Sibley, Felton, Greenmount, East Greenmount, Mount Sibley (Ascot), Ramsay, Southbrook, Bony Mountain, Elbow Valley, Greymare, Lord John Swamp, Pratten, Talgai, and Victoria Hill Cheese Factories.

Division No. 5.—Brachead (Peeramon), Coalstoun Lakes, Dundarrah, Glen Allyn (Malanda), Silvermist (Malanda), Cheese Factories, and the Queensland Agricultural High School and College, Gatton.

Nominations will be received by the Returning Officer, Department of Agriculture and Stock, Brisbane, until 5 p.m. on the 25th June, 1930, for election as growers' representatives on the Cheese Board.

Five such representatives are to be elected by the growers, as defined in the Order in Council dated the 22nd May, 1930, as mentioned above.

Each nomination is to be signed by at least ten growers as above, in the division concerned, in accordance with the Order. The elected representatives will hold office for the period from 1st August, 1930, to 31st July, 1933.

Dairying at Mackay.

Thus "W.M." in the "Live Stock Bulletin:—

In previous issues we have referred to the progress being made with the development of dairying at Mackay, Queensland. On the 1st March last, Mackay's butter factory began operations and although the people of the sugar centre were inclined to doubt the success of the venture, the first day's operations brought forth thirty-eight suppliers with a total of 1,269 lb. of cream, which produced 637 lb. of first-grade butter. Progress right through the month has been steady, the figures for the first three weeks of March being 4,255 lb., 3,951 lb., and 4,001 lb., the corresponding output of butter being 2,237 lb., 2,077 lb., and 2,070 lb. It will thus be seen that the average weekly output of first-grade butter for the first months of the factory's history was a little less than a ton. As the consumption of butter in Mackay and district is approximately 7 tons a week, the factory has an "open go" to reach and overtake this local consumption.

The quality of the butter is of the best, and is in demand by merchants and the general public. In addition, the whole district is very enthusiastic over the factory, and dairying is making great strides.

Cattle of the best quality are being brought to the district, and generally speaking, the Mackay district is just about in the midst of a dairying boom. Lands that would not previously be looked at are now coming into demand for dairying, and agitation on behalf of the people is having the effect of new scrub lands being opened up in various parts of the district for dairying.

Litter Records that will Stand Competition.

Advice recently to hand from America indicates that while G. F. Volle, of Knox County, Indiana, backslid a bit by crossing other blood with his Hampshire pigs, he did make a remarkable production record—8,080 lb. of pork produced from four litters in six months. One litter of ten pulled down the beam at 2,310 lb., one of eleven weighed 2,174 lb., another of eleven 2,122 lb., and the other with only seven 1,484 lb. These pigs were raised in strict accordance with the McLean County System of Sanitation on a balanced ration. One of the most interesting features of the accomplishment is the fact that Mr. Volle only had four sows on his farm.

These records are spoken of as indicating the superior quality of the Hampshire breed, a white-belted American pig that has not yet been introduced into Australia. It is also stated that the Hampshire characteristics, as is customary in all crosses of this nature, are strikingly evident in all of his pigs. The records will be hard to beat.

A.I.F. Reunion Committees.

The secretary of the United Council of Queensland A.I.F. Units advises that the magnificent response of ex-members of the A.I.F. to the appeals of the reunion committee, asking them to join in the march on Anzac Day was most gratifying. A further appeal is, therefore, made to returned men to assist their committee in keeping them in touch one with another. This help may be afforded by every Digger belonging to a unit that has formed a committee, communicating with the hon. secretary of that association, giving his name and address. This will assist in compiling and keeping the nominal roll up to date. The names and addresses of the hon. secretaries of reunion committees are as follow:—Artillery, H. J. Watkins, Kellett street, Auchenflower; 2nd Light Horse, J. Holliday, Anzac Club, Elizabeth street; 5th Light Horse, R. S. James, care Masonic Club, Creek street; 9th Battalion, J. D. Allan, care Lands Department, Brisbane; 15th Battalion, J. Churchill, care Trittons Limited, George street; 25th Battalion, W. Prentice, care Repatriation Department, Brisbane; 26th Battalion, R. Daniels, care Overells Limited, Valley; 31st Battalion, A. Mirls, 146 Queen street; 41st Battalion, V. Smallwood, care Repatriation Department, Brisbane; 42nd Battalion, G. J. Angell, Box 1503V, G.P.O., Brisbane; 47th Battalion, B. J. Platt, care Overells Limited, Valley; 5th Motor Transport, I. Cooper, care Anzac Club, Elizabeth street; 7th Field Ambulance, care Bernie Harris, Harris and Sons, jewellers, Edward street, City. There are still many Diggers who served with units that have at present no organisation catering for their welfare. Every possible assistance towards establishing committees among the following Queensland A.I.F. units:—Flying Corps, Engineers, Pioneers, Army Medical Corps, Army Service Corps, 49th and 52nd Battalions, will be given by the United Council of Queensland A.I.F. Units. Communications should be sent to the hon. secretary, Mr. Viv. Brahms, Box 1503V, G.P.O., Brisbane.

Milking Persistency.

It will be generally agreed that the value of a dairy cow depends upon her ability, not merely to produce a heavy milk yield, but to maintain high productivity over a period of years, and to combine this with a generous output of butter fat A list has just been compiled by the English Guernsey Cattle Society, which gives wonderful proof of the milking persistency of the Guernsey cow. Forty-five cows appear in this new list of merit.

They have all of them gained five, six, or seven certificates under the Society's Advanced Register scheme, which has only been in full operation since 1919, and thus all of these cows have completed five or more lactations of exceptionally heavy yields, both of milk and butter. The overall average for the forty-five cows and their combined total of 243 lactations is approximately 1,000 gallons of milk of over 5 per cent. butter fat. This, of course, only includes pedigree cows which are actually being tested for butter fat by the society.

Among the cows so listed is Trengwainton Sweet Briar 2nd, the property of Colonel E. H. W. Bolitho, with a yield of 76,208 lb. of milk and 3,702.68 lb. butter fat in seven lactations; Chorleywood Programme 3rd, in Mr. E. Gerrish's herd, near Land's End, in Cornwall, with a total yield of 66,065 lb. milk and 2,976 lb. butter fat in six lactations; and Juno of Echelle, a cow in Lord Poltimore's herd, with a yield of 69,235¾ lb. of milk and 3,884 lb. butter fat in seven lactations; Downe Fleur of Vimiera, in Mr. Walter Dunkels' herd, has given 67,543 lb. of milk and 3,530 lb. butter fat in seven lactations.

The yield of Tregye Maze (the famous 2,000-gallon Guernsey cow) for five lactations is 61,137¼ lb. milk and 3,217.46 lb. butter fat, with an average butter fat percentage of 5.26.

The Value of Grass

At one time farmers simply looked on grass as a cheap food that was provided for their benefit by Nature, and not a crop that needed manuring or care of any sort. To-day, thanks to science, such men are better informed, and know that as with arable land so with pasture, they cannot expect the best returns unless they put something there. Grass is, after all, practically the basis of all life, and it is to be looked upon as one of the most valuable foods for all kinds of live stock, not excepting the pig. Therefore, no efforts should be spared to get a good crop, one that will provide an early bite, and also last long into the autumn. Carefully-planned systems of manuring and grazing will help this object to its desired end, but haphazard use of the pastures will only rob them of nourishing verdure. It is not every farm, especially those on the hills, that is well equipped with grass land, and thus it is up to the farmer to do the best he can to aid Nature in the provision of this natural food.—"Live Stock Journal" (England).

Marketing of Strawberries.

Regulation 188 under the Primary Producers' Organisation and Marketing Acts has been approved. This regulation provides for the conducting of a poll to decide whether an Order in Council shall be made declaring that strawberries grown in Queensland shall be acquired by the Committee of Direction as the owners thereof. The proposed Order in Council will apply to all strawberries grown in Queensland for canning purposes or for sale on a wholesale basis during a period of one year from 15th May, 1930—that is, to 14th May, 1931. The ballot is to be conducted by the Committee of Direction. Growers entitled to vote at such poll will be growers of strawberries in the State of Queensland who declare they expect to have strawberries for sale on a wholesale basis during the above period of one year. The roll of persons eligible to vote shall be compiled by the Committee of Direction from their records, and other sources of information. To insure their names being on the roll, persons eligible to vote are invited to send their names and addresses at once to "The Committee of Direction of Fruit Marketing, Turbot street, Brisbane."

Queensland Pastoral Supplies, Limited—Buyers' Guide.

The most satisfactory feature of this catalogue, which has just come to hand, is the impression gained that the company's motto—"Service before Self"—has been the basic maxim in all its operations. Numerous letters from buyers, which are scattered throughout its pages, attest to this fact, and you can scarcely open a page without alighting upon some maxim, philosophic truth or similar interesting matter, which relieves its contents of any sense of monotony. In the grocery and housekeeping departments various recipes are given for using the particular line referred to. It is a condition of purchase with this firm that its prices are understood never to be higher than any other wholesale house—otherwise a buyer has the right to deduct the difference.

Flies Transmit Swine Fever.

Recent American advices inform us that hog cholera (here called swine fever) is not, as commonly supposed, carried so much by man or pigeons as it is by both barn and house flies.

This finding is the result of ten years of investigational work chiefly in Iowa (United States of America). By liberating flies that were coloured for later identification, it was learned that they had travelled as far as 13 miles, going 6 miles in twenty-four hours. House flies followed a team 2 miles. According to Dr. C. N. McBride, of the United States Bureau of Animal Industry, if more of the Western farmers in the United States would bale as much straw as was needed and burn the rest of it, they would be doing a wise thing as far as swine fever is concerned. Wet straw and manure piles make ideal breeding places for stable flies and should be spread on the fields with a manure spreader (or be ploughed in as soon as possible) rather than be allowed to accumulate around the barns or feed yards. This is good advice that should be carefully noted by every farmer.

The Goal.

Three things to govern: Temper, tongue, and conduct.

Three things to cultivate: Courage, affection, and gentleness.

Three things to commend: Thrift, industry, and promptness.

Three things to despise: Cruelty, arrogance, and ingratitude.

Three things to wish for: Health, friends, and contentment.

Three things to admire: Dignity, gracefulness, and intellectual power.

Three things to give: Alms to the needy, comfort to the sad, appreciation to the worthy.

Points in Dairy Practice.

Feed regularly and plentifully. In addition to pastures, grow fodder crops, if possible, all the year round. Grow lucerne, if possible, if only a quarter of an acre. During the autumn plant oats, vetches, wheat, barley, &c., and during the spring and summer grow maize, sorghum, saccaline, Sudan grass, &c. In addition, give the cows a little concentrated food, such as crushed oats, maize meal, bran (each two parts), mixed with lucerne chaff (eight parts).

Improve your pastures by top-dressing and the sowing of winter grasses and clovers. The pasture on land which has been used for dairying for a long period without any effort being made to return to the soil the mineral constituents which have been taken from it becomes deficient in such ingredients, and the animals that graze on it suffer. In some dairying districts there is need for a change of food from paspalum, which in districts where frosts are experienced produces little or no nourishing material in the winter. Better pastures mean healthier and more consistently productive cattle.

Divide your farm, if possible, into small sections—say, of 10 acres each—and graze them off in rotation. Thus the cows have fresh young pasture all the time, and their milk yields are increased.

A lick should be provided on most dairy farms. A suitable one for most conditions is forty parts Liverpool salt, ten to twenty parts bonemeal, and one part sulphate of iron.

Profit by the security afforded by a reserve of feed in the form of silage. The most convenient form of silo for the dairy farmer is the overhead type; but a stack is cheaply constructed, and where the soil is suitable a pit silo can be used. Silage is a good insurance against times of scarcity; it does not burn or deteriorate, and cows milk well on it.

If there is an experiment plot in your district, watch the trials and learn from its successes and failures.

Join, if possible, a herd-recording unit; it is the cheapest and most effective way of getting at the yields of your cows. Put a pure-bred bull of known and recorded production strain at the head of the held, keep his heifers out of the highest-yielding cows, and as soon as they come in cull out and sell to the butcher the low producers. It is wonderful how quickly the average yield of the herd goes up if it is managed on these lines.

Feeding well is the basis of everything in dairying. Testing the cows is only the means of finding out if they respond to the food given them; some respond, others do not—that is the difference between the profitable and unprofitable individuals. Under the present economic conditions only the best should find a place in the milking-yard.

The Art of Flying.

"Many people have an erroneous idea about flying. Some think it is a romantic undertaking or a suitable outlet for recklessness," said Mr. L. J. Brain, A.F.C. (Brisbane manager of Qantas Ltd.), when delivering an instructive address on the "Art of Flying" to members of the Queensland section of the Australian Aero. Club, at Empire Chambers, last night. The art of flying was essentially an exact science, continued Mr. Brain. As a modern means of transport it was already playing an important part in the community, and would play an even greater part in the future. Aviation could in no way be regarded as a "show" business. The two essential qualifications for the beginner were that he should be young and mentally alert. The best type was a quick thinker, but cautious, without discarding the normal ideas of what constituted safety or foresight. Mr. Brain then detailed the progressive steps of a beginner to the last stages where he was capable and competent for his pilot's ticket. He strongly advised members against flying in adverse conditions. Statistics showed that even with the most experienced pilots the greatest percentage of accidents was due to flying "blind."

District Canegrowers' Executives.

Regulations under "*The Primary Producers' Organisation and Marketing Acts,* 1926 *to* 1928," relating to the election of Chairmen and the powers of Chairmen of District Executives, have been approved. The Regulations are numbered from 239 to 245, and deal mainly with the mode of election of a Chairman. Briefly, they provide as follows:—

(*a*) That every District Executive shall, within a reasonable time after the declaration of the poll, meet to elect one member to be Chairman.

(*b*) That at the election the Secretary or Acting Secretary shall preside, but shall not exercise either a primary or casting vote.

(*c*) The person declared to be elected must have received a majority of the votes cast by all elected members.

(*d*) If no member obtains a majority of votes, the Secretary shall convene a special meeting to elect the Chairman.

(*e*) Such meeting shall consist of three representatives from each Mill Suppliers' Committee in the district represented by the District Executive and the elected members of the Executive, provided that an elected member of the Executive shall not act or vote as a representative of a Mill Suppliers' Committee as well as an elected member of the Executive.

(*f*) At such special meeting the Secretary or Acting Secretary of the Executive shall preside, but shall not exercise a vote.

(*g*) The Chairman of a District Executive shall have both a primary and a casting vote.

Winter Work in the Vineyard.

Viticulturists may be reminded of the importance of making an early start with the winter ploughing.

All the operations pertaining to the working of a vineyard throughout the summer have a tendency towards the consolidation of the soil immediately below the surface. This is accentuated by early autumn rains, and by the growth of weeds incidental to such rains. In such a condition, accumulated water is quickly shed from the surface, and more particularly so if the land has any appreciable fall. Winter cultivation aims at enabling the land to absorb moisture and preventing "run-off," and a broken, loose condition is therefore produced. Naturally, the rougher and more open the surface, the more easily does the water find lodgment, and the more certainly reach the subsoil. In the early winter cultivation, destruction of weeds is purely secondary, although it is very largely effected.

Under normal circumstances, the earlier the winter ploughing can be started the better. Where small areas are concerned it is a simple matter, but with large vineyards the work has to be started early in order that it may be completed in good time. The nature of the soil has to be considered, and the ploughing so arranged that the most difficult portions are completed first. Heavy soils should, in most cases, be completed before they become too wet, while lighter ones may safely be left until later, as they may be ploughed at almost any time.

The system of ploughing varies in different districts and according to local custom, but it should be accepted as an axiom that the lower the average rainfall the greater the care that should be put into cultivation. Efficient work aims at complete turning of every portion of the surface at least twice a year.

The system generally recommended is as follows:—So soon as the land is in a fit condition for ploughing, plough to a depth of 6 inches away from the vines, throwing the sod towards the centre of the row, keeping the crown as low as possible, and turning subsequent furrows over, until vines are reached upon either side. The strip of soil left unploughed underneath the crown will be worked during the second ploughing. It is not always advisable to plough deeply right up to the vines, owing to the possibility of severing important roots, or even pulling the vine out of position. It is preferable to turn the last furrows with a lighter finishing plough. Implements are obtainable that are so constructed that the body is set over from the beam, which is at the same time movable, and can be set right out to allow the horse to walk wide of the row. In this way there is very little left unploughed—simply a small strip against the vines, which is easily treated by means of a hoe.

For the ploughing of large areas ploughs can be procured up to size of four furrows, and which can be adjusted for finishing off close to the vines, and again readjusted for the second or throwing-on ploughing, thereby doing away with single-furrow work. The hoeing operation may be accomplished by hand, or by a specially-constructed implement known as the "vine hoe," which carries a hoe or blade out upon an arm so that when guided by the steering disc on the near side, it can be worked around the stems of the vines with ease, turning one-half of the unploughed strip on either side. When the whole work has been completed the soil is high in the middle of the rows, while the vines stand in the depression, and are therefore more likely to get the benefit of any rain that falls. The uneven and rough surface meets, in an ideal manner, the requirements mentioned above.

The soil is permitted to remain in this condition throughout the winter, and harrowed prior to the second ploughing to facilitate the operation, and left until such a time as it may be desirable to push on with the further cultivation. Pruning and other work will be completed in the meantime.—A. and P. Notes, New South Wales Department of Agriculture.

Points in Bacon Curing.

1. Use judgment in selecting the pig, which should be about 150 lb. live weight. Select perfectly healthy pigs, free from bruises, cuts, sunscald, &c. Sows passing through the oestral period should be held for at least ten days, otherwise good-keeping meat will not result.

2. Before slaughtering let the animal fast for eighteen to twenty-four hours, keep it quiet, and allow plenty of clean drinking water.

3. Never kill an animal which is losing weight, or which has become overheated just before killing time.

4. Kill animals by sticking to ensure thorough bleeding.

5. Exercise care in scalding, and see that the carcass is cleaned thoroughly and that no hair is left thereon.

6. Adopt convenient cutting to give efficient drying. (A good method is to divide the side into shoulder, middle, and ham.)

7. Release joint oil from cavities of joints in both shoulders and hams.

8. Have the tables and the room in which the curing is to be conducted scrupulously clean.

Dalby Show.

It can be said with safety that the dairy cattle section at the recent Dalby Show was one of the factors which did a good deal to making the event the success that it was. The dairy cattle section was an excellent one. The quality of the Jerseys and I.M.S. was all that could be desired, while the Jerseys had some outstanding animals amongst them. The display of pigs was the best ever seen at Dalby, Duroc-Jerseys, Berkshires, and Tamworths being the three breeds shown.

Mr. W. Middleton, Wyreema, Queensland, judged the cattle section, and made the following awards:—

Champion Jersey bull, Mr. D. R. Hutton's Bellefaire Blondes Bellringer. Champion Jersey cow, the same owner's Trecarne Rose II. Champion I.M.S. bull, F. G. Lamkin's Fuschia's Monarch. Reserve Champion, I.M.S. bull, P. J. Skernan's College Molly's Prince. Champion I.M.S. cow, W. F. Kajewski's Cherry VI. of Burradale, with the same owner's Rainbow VI. of Upton reserve champion cow. The Ayrshire class for cow 3 years old and over was won by Mr. R. C. Drew's Shudley Model.

The Home and the Garden.

OUR BABIES.

Under this heading a series of short articles by the Medical and Nursing Staff of the Queensland Baby Clinics, dealing with the welfare and care of babies, has been planned in the hope of maintaining their health, increasing their happiness, and decreasing the number of avoidable cases of infant mortality.

MILK.

OF all foods milk is the most necessary, the most easily contaminated, and the most perishable. Without good milk children cannot be healthy, and babies cannot live. Cow's milk should seldom be necessary for the young infant, but after weaning it is indispensable. No other food is so important for the public health.

Neutralising Contamination.

Milk as it comes from the cow is almost free from germs, but it soon becomes contaminated by all sorts of bacteria. Some of this contamination is unavoidable. Much of it comes from dirt on the cow's udder and flanks, the milker's hands, and the air of the cowshed. Stray hairs, flies, and fragments of cow food or cow manure drop into the milkpail or are blown into it, and all of these contain bacteria. Worse than all these are the myriads of bacteria contained in unsterilised milkcans. Washing with boiling water is an imperfect method of sterilisation, for the water is not boiling when it gets into the cans, and its contact with their interior is too short. Efficient steam sterilisers are not available except in factories. For these reasons much milk is dirty at the start, and most milk is doubtfully clean.

If milk is fairly clean to begin with it does not keep clean for more than a few hours at ordinary temperatures, for the bacteria that have been introduced grow with extreme rapidity. Fortunately there is an interval during which the bacteria do not increase in number in fresh clean milk. At 50 deg. Fahr. such milk will remain fresh and clean for twenty-four hours, at 60 deg. for twelve hours, at 70 deg. for six hours. At the end of this period it deteriorates rapidly. Unfortunately, milk which is dirty from the first deteriorates much earlier.

If, therefore, at temperatures of over 70 deg. we wish to keep milk for twelve hours or more, there are only two alternatives. Either the milk must be kept constantly chilled to below 50 deg. or the milk must be heated. The most simple method is to bring the milk to boiling point (212 deg.) and then cool it. Boiling destroys all but a few of the contained bacteria, but these will grow, and boiled milk is not safe for more than twelve hours at summer temperatures. Another method is pasteurisation, which is the heating of the milk to a lower temperature (145 deg.) and keeping it at that temperature for thirty minutes. After pasteurisation it should be put into sealed sterilised bottles and kept chilled until delivery.

How Epidemics may be Caused.

Occasionally milk becomes contamined by disease germs, either derived from the cow (for instance, those of tuberculosis) or from the milkers or those who handle the milk (for instance, those of typhoid, scarlet fever, and diphtheria). Such contaminations not only cause disease; they have frequently caused epidemics. Against this danger the only perfect safeguard is boiling or pasteurisation. By our domestic habit of boiling milk we in Queensland are saved from much disease which in States with shorter summers results from the unclean habit of drinking raw milk.

Dried Milk.

Of late years dried milk has come into use and is much advertised. It has unquestionably been of much value where clean fresh milk has been unprocurable. Many babies have thrived on it, but, unfortunately, many others have failed to thrive. Like other tinned foods, we have found it sometimes a useful substitute, but inferior to good fresh milk. It is also, of course, more expensive.

Science Serves the Consumer.

When Brisbane was a small town there was no great difficulty in the milk supply. As it grew into a large city, and the milk suppliers were driven further and further out, much of our milk became very inferior and unsafe for babies. Fortunately, sound and scientific methods have of late provided us with a trustworthy supply of chilled pasteurised milk in sealed bottles. It is thus ensured against contamination by dust and road sweepings while being distributed. Kept on ice it is safe for twenty-four hours. If not iced it is safe for twelve hours; if kept longer it should be scalded at the end of that time. For nearly three years this milk supplied by the Metropolitan Milk Supply Company has been used by the Baby Clinics and Creches in this city, and we have found it safe and wholesome.

It is much to be regretted that there are other towns in Queensland which need, but have not, an equally good milk supply.

WINTER DANGERS.

A baby may suffer from diarrhœa—that is to say from loose and frequent motions—caused by improper feeding at any time of year, but cases of severe diarrhœa are much less common during the winter months. In particular the epidemics of infectious diarrhœa or dysentery do not occur during the cool weather. On the other hand, a number of infections causing coughs and colds, which may occur at any time of the year, are more common and more serious during the winter. Although winter in Queensland should be a healthy season, many unnecessary deaths of infants and young children from bronchitis and pneumonia may be expected at this time. We should have fewer deaths if mothers only knew that these diseases follow infection. There are a large number of disease organisms which attack the nose and throat, sometimes spreading into the ears and lungs. Among them, to mention only a few, are those which cause influenza, measles, and whooping cough.

The Common Cold.

By far the most common infection of the air passages is that known as a "common cold." Baby has a running nose, a cough, and is feverish for a day or two. His mother says he has caught a chill, and does not know she is talking nonsense. These "colds" are infectious diseases spread from person to person. Though usually mild diseases, they are the most common causes of abscesses of the ear, bronchitis, and pneumonia. If mothers would try to protect their infants from infection we should have fewer deaths. "Colds" are more common in winter, because then people stay more indoors with closed doors and windows, so that living germs spread more easily from one to another, and at this season many people are carrying these germs about. If you allow anyone who comes into your house to fondle or kiss your baby, his chances of catching a "cold" are very many. Or one of the older children gets the infection at school, which you cannot help, comes home, and straightway gives it to the baby, which you can and should prevent. Do not get a "cold" yourself, for then it is difficult to avoid infecting your babe, though you should try. We have seen a woman forcing infection into a baby by putting a dummy into her own mouth and then into the baby's mouth. This is horrible.

The Baby at the Picture Show.

But infection spreads in other ways. Whenever anyone coughs or sneezes he sprays his germs into the surrounding air to be breathed in by other people. Of course, he should smother his cough with a handkerchief, but he often does not. Even loud talking will spray germs about. This is how crowds of people in closed halls, such as picture shows, become infected easily and rapidly. If you take your babies to these places you are either very careless of their health or know little how to preserve it.

Plenty of Fresh Air for the Young Australian.

You can do very much to protect your young children from these infections, but you cannot always be successful. Therefore keep them strong and healthy so that they may throw off infection as easily as possible. Do not keep them shut up indoors; this lowers their strength and increases the risk of infection. See that they always have plenty of fresh air to breathe, especially at night. Clothe them sensibly according to the weather, but do not overclothe, for this weakens their resistance. Keep them strong and healthy by proper feeding. Bottle-fed babies and poorly-nourished children stand the worse chance.

The Safest Thing to Do.

The chilliness that comes before a "cold" is not the cause of the "cold"; it is the beginning of the "cold." The safest thing to do with a child who has a "cold" is to put it to bed till it is better. Certainly it should be kept in bed as long as it is feverish and a day longer. It will be thirsty, so let it have plenty of water or fruit juice, and water. It will not be hungry, so never force food on it. This rule applies also to young babies who should have more water and less milk until the trouble is over.

If the mothers of Queensland will take the advice here given, we shall pass through this winter with fewer deaths.

HOW TO COOK A HAM.

"Too many cooks spoil the broth," but one cook is often quite enough to spoil the meat! Like the bad workman, who blames his tools, the bad cook is ever ready to declare that the shortcomings of the joint when it comes to table are to be looked for in the meat itself rather than in the method of preparing it. And if there is one joint more than another that requires careful preparation and careful cooking, it is a ham. There are good hams and bad hams, but how many of the former have been entirely ruined by an unskilful or careless cook! An all-important matter in regard to a ham is the length of time given to soaking it beforehand. A mild ham may not require more than twelve hours, but one that is strongly salted may want twenty-four or even thirty-six hours. By looking at it one can often tell how it has been cured, or by putting a skewer into it and applying the tip of the latter to the tongue, one can judge whether the ham be over-salt or not. In any case, it is well to err on the liberal side when soaking. After the ham has been sufficiently soaked, it should be scraped quite clean and dried with a clean cloth. Then it is put into cold water in a cauldron large enough to allow for swelling, and brought very gently to the boil. After that it should be allowed to simmer slowly until it is cooked. The time to be allowed for simmering is thirty minutes for every pound it weighs in the case of a large ham of, say 12 lb. or over. For a smaller one rather less may suffice. It may be tested with a skewer, which will go in and come out clean and readily if the cooking is complete. The ham should then be set aside to cool in its liquor, after the skin has been removed.

KITCHEN GARDEN.

Should showery weather be frequent during July, do not attempt to sow seeds on heavy land, as the latter will be liable to clog, and hence be injurious to the young plants as they come up. The soil should not be reworked until fine weather has lasted sufficiently long to make it friable. In fine weather get the ground ploughed or dug, and let it lie in the rough until required. If harrowed and pulverised before that time, the soil is deprived of the sweetening influences of the sun, rain, air, and frost. When the ground has been properly prepared, make full sowings of cabbage, carrot, broad beans, lettuce, parsnips, beans, radishes, leeks, spring onions, beetroot, eschalots, salsify, &c. As westerly winds may be expected, plenty of hoeing and watering will be required to ensure good crops. Pinch the tops of broad beans which are in flower and stake up peas which require support. Plant out rhubarb, asparagus, and artichokes. In warm districts it will be quite safe to sow cucumbers, marrows, squashes, and melons during the last week of the month. In colder localities it is better to wait till the middle or end of August. Get the ground ready for sowing French beans and other spring crops.

Rhubarb.

The continued production of rhubarb may be greatly assisted by giving a heavy mulching of manure and hoeing it well into the soil. Keep the beds well watered, and give regularly a dressing of liquid manure, say, once a week.

It is not necessary to use forcing manures on the young stock, as plants are ruined if forced in the early stages of growth.

The rhubarb makes rapid growth during the autumn and spring, and when stalk cutting has been started liquid manuring and manuring may be given.

Lettuce Culture.

A thin sowing of lettuce seed where the plants are to mature insures not only an earlier crop, but it will be found that the plants grown in this manner are far less likely to run to seed than others transplanted from over-crowded seed-beds.

Lettuce resents checks in all stages of growth, and through inattention in the early stages many losses occur through early seeding. An undisturbed plant may be relied upon to give a good head at least a fortnight or more in advance of others, and for this reason alone it is worth while taking a little extra care in preparing the bed and sowing the seed.

A liberal dressing of manure is always beneficial to this crop, for, in addition to the food value, it retains moisture and keeps the roots cool during the hottest weather. Cow manure is the best, but whatever manure is used should be buried 9 in. below the surface. If it is put in deeper than this the roots will not reach it until the plant is well developed, and therefore unable to take full advantage of the food provided. Unlike many more delicate plants, the roots of lettuce will penetrate rank manure even when quite small, and grow very rapidly. Sow lettuce seeds in drills running from north to south. Draw them out with a blunt stick deep enough to allow a scattering of finely-sifted soil being placed in the bottom, and the seed being covered 1 in. deep. This will ensure an early and very even germination. When the seedlings are about 1 in. high, thin out to one plant to every 6 in. of the row. Frequent stirrings of the soil and an occasional dusting of soot will induce rapid growth, and if, when the plants are half-grown, the surface of the bed is given a dressing of either nitrate of soda or sulphate of ammonia, at the rate of ½ oz. to each yard of row, and lightly forked into the ground, and afterwards well watered in through a fine-rosed can, the plants will readily respond. Good results will follow an application of liquid manure or even soot water.

ROSES.

From the Pacific Nurseries, Wondall road, Manly, Queensland (Messrs. C. W. and A. C. Heers) comes to us their 1930 Rose Catalogue, an excellent little booklet that should be in the hands of every rose grower. The nurseries are easily accessible from the city and are open to all for inspection.

The following useful working notes are culled from this valuable catalogue:—

Time for Planting.—From June until the end of September. For the coastal, excepting perhaps the far North, we specially recommend the later period, and, in support, advance the following reasons:—

(1) Every horticulturist must admit that all roses invariably exhibit luxurious and succulent growth and wealth of bloom during the months of March, April, May, and early June. This being so, we contend that as the plants are full of flowing sap they not in a fit condition for transplanting during that period.

(2) Roses planted during the earlier months readily respond to the warm periods which assuredly occur in the middle of our winter, only to be as surely struck by our colder and more frosty days during the latter part of the winter. This shock not only checks the growth, but actually kills the tender white jelly-like roots then in the forming. There can be only one result—a plant with stunted growth upon which the foundation of your future tree has to be built. Remember, if these plants are left undisturbed in the nursery they remain dormant.

(3) On the other hand a thoroughly rested and ripened plant, transplanted during late July, August, or September, according to the trend of the season, is ready to break away into full and vigorous growth as the warmth of Spring appears, never to look back.

We readily admit that the rose, being a hardy plant, may even do well when planted early, but after much experience we prefer to pin our faith to late planting in most parts of Queensland where our winter is so variable. Holding these views, we hope clients will not ask us to send roses out earlier than June, although we much prefer, whenever convenient, that you follow our advice and plant later in the season, say, from the middle of July to the middle of September.

It is gratifying to us to know that quite a number of clients after acting upon our advice, write to say how pleased they are with their experience of late planting; so we reiterate—do not plant or prune roses too early in Queensland, especially along eastern slopes.

Roses should never be planted when the ground is sodden as the soil glues together and excludes the air so necessary for the future welfare of the plant. Rather delay planting, and in the meantime bury the whole plant lengthwise, cover completely with soil and await more favourable conditions.

Although Roses do well under almost any condition, it will always repay you to trench and drain the ground. However, should the ground be flat and unsuitable for drainage, it is better to dig it a foot deep and raise the bed. Such beds require hardwood or concrete borders, otherwise the outside plants dry out too easily. Work in a liberal supply of well-rotted cow or stable manure. This work should be done at least four weeks prior to planting. Plant so that the union will be just under the surface of the ground. In the case of light, sandy soils it is an advantage to have the union as much as two inches below the surface. Never on any account place fresh manures or any form of fertiliser near the roots at the time of planting.

The roots should be evenly spread and so arranged as to give them a downward tendency; cover with about three inches of fine soil and press down firmly; fill in and give a liberal supply of clean water. Keep the earth away from the graft until the plant strikes; in the meantime mulch with straw in order to protect union and keep the soil from caking.

The mulch also creates an ideal condition for further waterings. Should the weather continue dry, it will be necessary to water at intervals according to the conditions. Do not use fresh manure or artificial fertiliser near the roots when planting. Should the sun's rays become hot after planting, it is advisable to provide the plant with artificial shade.

Suckers.—Always keep a sharp lookout for brier suckers, which may from time to time sprout from below the graft. These are readily detected by their foliage, and if not removed they will in time kill the rose tree.

Manuring.—Roses should be heavily manured at least once a year, well-rotted animal manure being the best. It should be spread over the bed and lightly forked in. Bone dust and other suitable fertilisers are also beneficial. Established rose trees are greedy feeders, and periodical light dressings of fertiliser, applied during damp weather, give good results. Heavy soils need occasional dressings of lime, which, however, should not be used within a month or so of fertilisers.

Pruning.—There is no phase of rose culture more difficult to impart than that of pruning. After accepting the broad principles generally laid down, make a close study of the habits and peculiarities of the various types of roses. Apply common sense methods and observe and profit by the results obtained. We are opposed to early pruning in this State for similar reasons to those advanced against early planting. However, varieties with H.P. strain may, if the canes are sufficiently ripened, be shortened during March or April to from 3 to 5 ft. from the ground—the weaker the shorter. This will ensure a wealth of bloom in the late Autumn. For the annual overhaul the end of July and August is the best time. Hard pruning as practised in cold countries must not be generally applied here. The reason is not far to seek as the periods of inactivity are short and uncertain. Make the prevailing conditions your guide as to how and when to prune. Assist the pruning problem by observing the following golden rules during the entire season:—(1) Cut away dead, spindled wood; (2) Always cut blooms and stems that have bloomed well back to a strong eye; (3) Never allow seed pods to form on the bush. By these means you will encourage correct growth and freedom of bloom. There are odd varieties which resent the knife.

It is most important that plants be kept free from scale and other diseases, otherwise valuable portions have to be prematurely removed to the detriment of the plant. Exhibitors should prune harder than those growing for general purposes. Tea roses require lighter treatment than H.T.'s and H.P.'s.

To prune, cut away all dead, diseased, and spindling wood; thin out anything that is liable to crowd; cut back shoots to a strong eye, pointing outward in the case of uprights and inward on those of spreading habits; preserve any new, strong shoots coming from the base (often misnamed water shoots) that may serve to replace any worn out stems that should be renewed every three years or so.

As soon as the new growth appears, carefully rub off any shoot that is likely to overcrowd or grow in a wrong direction.

Climbers should be allowed their fling during the time they are establishing themselves. Train the strongest canes horizontally, about 18 in. apart, shorten the ends, and cut away all other wood. Provide for the renewal of these trailers every couple of years or so.

Aphis.—Nicotine sprays, such as Black Leaf Forty, are most effective. They may be kept in check by applying the hose freely.

Scale.—Spray with either red oil, kerosene, emulsion, or any lime-sulphur mixture. Many roses are lost annually through scale.

Grubs, &c.—For all leaf, plant, and flower-eating insects, spray with arsenate of lead as directed.

Mildew.—This is a stubborn fungus disease that has for many years past baffled our scientists. The rose, like all other life, no doubt requires a properly balanced food, and as analyses show that our soils are often deficient in potash and lime, it is not altogether surprising to find that, where good dressings of wood ashes have been applied, appreciable improvement in reducing the mildew scourge is apparent. Experiments are being conducted all over the world in search of a cure for mildew, and reports to hand show that potash used in its various forms gives results which are at least reassuring. For our part we can say that we have found the use of wood ashes, also spent carbide, beneficial. If these are not available, try giving each established tree say 4 to 6 oz. of sulphate of potash, in addition to lime, and observe the result.

Regular sprayings with liver of sulphur (1 oz. to 2 gallons of water), or 1 oz. bicarbonate of soda to 1 gallon of water, or Bordeaux, will ward off attacks. Remedies: Flowers of sulphur 9 parts, arsenate of lead 1 part, well mixed, applied with a bellows when the dew is on the foliage. Sprays: Sulphuric acid 1 part to 800 parts of rain water,. One ounce bicarbonate of soda to 1 gallon of rain water is a helpful spray. A drastic remedy is 2 tablespoonfuls Lysol to 1 gallon of water. Sprayings should be done before noon. Always treat the underneath as well as the top of the foliage.

Failures are generally attributable to one or more of the following causes:—

Having used fresh manures or fertiliser at time of planting; allowing roots to be exposed after unwrapping; lack of drainage or planting in soggy ground through excessive wet weather; planting too near the edge of raised beds, too near shrubs, trees, and/or hedges, also in shady positions; allowing plants to dry out after westerlies; giving too much water during first fourteen days; heavy frosts just after planting or even when the plant is established; planting too deep, planting too shallow, or planting too loose; acidity in damp or poorly prepared soils; chemical reactions from fertilisers previously applied to the soil; plants being knocked by children or the thoughtless gardener; dogs and cats are often the cause of plants dying or being damaged; the use of strong soap suds, &c.; planting too early or too late; planting in same spot where a rose has been growing unless soil has been replaced.

FLOWER GARDEN.

Winter work ought to be in an advanced state. The roses will not want looking after. They should already have been pruned, and now any shoots which have a tendency to grow in wrong directions should be rubbed off. Overhaul the ferneries, and top-dress with a mixture of sandy loam and leaf mould, staking up some plants and thinning out others. Treat all classes of plants in the same manner as the roses where undesirable shoots appear. All such work as trimming lawns, digging beds, pruning, and planting should now be got well in hand. Plant out antirrhinums, pansies, hollyhocks, verbenas, petunias, &c., which were lately sown. Sow zinnias, amaranthus, balsam, chrysanthemum tricolour, marigold, cosmos, cockscombs, phloxes, sweet peas, lupins, &c. Plant gladiolus, tuberoses, amaryllis, pancratium, ismene, crinums, belladonna lily, and other bulbs. Put away dahlia roots in some warm moist spot, where they will start gently and be ready for planting out in August and September.

THE CARE OF THE LAWN.

For a lawn to be a success it must be carefully made in the first place. Good drainage is essential, for stagnant water-logged soil encourages weeds and kills the grass. The soil should be rich in plant food. Give the ground a heavy dressing of good manure, and thoroughly dig it over. Enough time should then be allowed for the soil to settle, as it must be firm when the grass is planted or there will be a series of hills and hollows shortly after. In addition to the manure apply the following mixture at the rate of 3 oz. to the square yard, forking or raking it well into the top spit of the soil:—2 lb. superphosphate of lime, 1 lb. bonemeal, and 1 lb. sulphate of ammonia.

Early in the spring, as the grass begins to grow, a heavy roller should be passed several times over the ground.

Lawns showing bare patches will require a dressing during the autumn, and the mixture previously mentioned will be found very suitable, and will keep the grass well nourished. Wood ashes and soot, combined or not, will also be found beneficial. All dressings should be applied during showery weather. If soil poverty is the cause of a patchy lawn, it is best to rake over in the autumn with a sharp-toothed rake, and dress with a good layer of fine soil and wood ashes.

Orchard Notes for July.

THE COASTAL DISTRICTS.

The marketing of citrus fruits will continue to occupy the attention of growers. The same care in the handling, grading, and packing of the fruit that has been so strongly insisted upon in these monthly notes must be continued if satisfactory returns are to be expected. Despite the advice that has been given over and over again, some growers still fail to grasp the importance of placing their fruit on the market in the best possible condition, and persist in marketing it ungraded; good, blemished, and inferior fruit being met with in the same case. This, to say the least, is very bad business, and as some growers will not take the necessary trouble to grade and pack properly, there is only one thing to do, and that is to insist on the observance of standards of quality and see that the fruit offered for sale complies with the standards prescribed, and that cases are marked accordingly.

Where the crop has been gathered, the trees may be given such winter pruning as may be necessary, such as the removal of broken or diseased limbs or branches, and the pruning of any superfluous wood from the centre of the tree. Where gumming of any kind is seen it should be at once attended to. If at the collar of the tree and attacking the main roots, the earth should be removed from around the trunk and main roots—all diseased wood, bark, and roots should be cut away, and the whole of the exposed parts painted with Bordeaux paste.

When treated do not fill in the soil around the main roots, but allow them to be exposed to the air for some time, as this tends to check any further gumming. When the gum is on the trunk or main limbs of the tree cut away all diseased bark and wood till a healthy growth is met with, and cover the wounds with Bordeaux paste.

If the main limbs are infested with scale insects or attacked by any kind of moss, lichen, or fungus growth, they should be sprayed with lime sulphur.

Towards the end of the month all young trees should be carefully examined for the presence of elephant beetles, which, in addition to eating the leaves and young bark, lay their eggs in the fork of the tree. When the young hatch out they eat their way through to the wood and then work between the wood and the bark, eventually ringbarking one or more of the main limbs, or even the trunk. A dressing of strong lime sulphur to the trunk and fork of the tree, if applied before the beetles lay their eggs, will act as a preventive. In the warmer localities a careful watch should also be kept for the first appearance of any sucking bugs, and to destroy any that may be found. If this is done systematically by all growers the damage done by this pest will be very much reduced.

Citrus trees may be planted throughout the month. Take care to see that the work is done in accordance with the instructions given in the June notes. All worn-out trees should be taken out, provided the root system is too far gone to be renovated, but when the root system is still good the top of the tree should be removed till sound, healthy wood is met with, and the portion left should be painted with a strong solution of lime sulphur. If this is done the tree will make a clean, healthy growth in spring.

The inclusion of a wide range of varieties in citrus orchards—and which has been the general practice—is to be deprecated. Even in new plantations there is a tendency to follow the same unprofitable lines. Far too much consideration is given to the vendor's description or the purchaser's appreciation of a particular variety or varieties. Individual tastes must be subordinated to market requirements, and the selection of varieties to the best available kind of early, medium, and late fruits. Amongst oranges Joppa should be placed first, Sabina for early fruit, and Valencia or Loon Giru Gong for late markets.

In mandarins local conditions influence several varieties, and since the introduction of the fungus known as "scab" the inclusion, particularly on volcanic soil, of the Glen Retreat and Emperor types is risky. In alluvial lands, Emperor and Sovereign (an improved Glen Retreat) are the most profitable, though Scarlet in many places is worth including, with King of Siam as a late fruit.

Land intended for bananas and pineapples may be got ready, and existing plantations should be kept in a well-cultivated condition so as to retain moisture in the soil.

Bananas intended for Southern markets may be allowed to become fully developed, but not coloured, as they carry well during the colder months of the year, unless they meet with a very cold spell when passing through the New England district of New South Wales.

The winter crop of smoothleaf pines will commence to ripen towards the end of the month, and when free from blackheart (the result of a cold winter) or from fruitlet core rot, they are good for canning, as they are of firm texture and stand handling. Where there is any danger of frost or even of cold winds, it pays to cover pines and also the bunches of bananas. Bush hay is used for the former and sacking for the latter.

Strawberries should be plentiful during the month, provided the weather is suitable to their development, but if there is an insufficient rainfall, then irrigation is required to produce a crop. Strawberries, like all other fruits, pay well for careful handling, grading, and packing; well-packed boxes always realising a much higher price than indifferently packed ones on the local market. Where strawberries show signs of leaf blight or mildew, spray with Bordeaux mixture for the former and with sulphide of soda for the latter.

When custard apples fail to ripen when gathered, try the effect of placing them in the banana-ripening rooms, and they will soon soften instead of turning black.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

July is a busy month for the growers of deciduous fruits, as the important work of winter pruning should, if possible, be completed before the end of the month, so as to give plenty of time for spraying and getting the orchard into proper trim before the spring growth starts.

In pruning, follow the advice given in the May number; and if you are not thoroughly conversant with the work, get the advice of one of the Departmental officers stationed in the district.

Pruning is one of the most important orchard operations, as the following and succeeding seasons' crops depend very largely on the manner in which it is carried out. It regulates the growth as well as the number and size of the fruit, as if too much bearing wood is left, there is a chance of the tree setting many more fruits than it can properly mature, with a result that unless it is rigorously thinned out it is undersized and unsaleable. On the other hand, it is not advisable to unduly reduce the quantity of bearing wood, or a small crop of overgrown fruit may be the result.

Apples, pears, and European varieties of plums produce their fruits on spurs that are formed on wood of two-years' growth or more; apricots and Japanese plums on new growth and on spurs; but peaches and nectarines always on wood of the previous season's growth. Once peachwood has fruited it will not produce any more from the same season's wood, though it may develop spurs having a new growth or new laterals which will produce fruit.

The pruning of the peaches and nectarines, therefore, necessitates the leaving of sufficient new wood on the tree each season to carry a full crop, as well as the leaving of buds from which to grow new wood for the succeeding year's crop. In other words, one not only prunes for the immediately succeeding crop, but also for that of the following season.

All prunings should be gathered and burnt, as any disease that may be on the wood is thoroughly destroyed. When pruned, the trees are ready for their winter spraying with lime-sulphur.

All kinds of deciduous trees may be planted during the month provided the ground is in a proper state to plant them. If not, it is better to delay planting until August, and carry out the necessary work in the interval. The preparation of new land for planting may be continued, although it is somewhat late in the season, as new land is always the better for being given a chance to mellow and sweeten before being planted. Do not prune vines yet on the Granite Belt; they can, however, be pruned on the Downs and in the western districts.

Trees of all kinds, including citrus, can also be planted in suitable situations on the Downs and western districts, and the pruning of deciduous trees should be concluded there. If the winter has been very dry, and the soil is badly in need of moisture, all orchards in the western districts, after being pruned and ploughed, should receive a thorough irrigation (where water is available) about the end of the month, so as to provide moisture for the use of the trees when they start growth. Irrigation should be followed by a thorough cultivation of the land to conserve the water so applied. As frequently mentioned in these notes, irrigation and cultivation must go hand in hand if the best results are to be obtained, especially in our hot and dry districts.

Farm Notes for July.

FIELD.—Practically the whole of the work on the land for this month will be confined to the cultivation of winter crops, which should be now making good growth, and to the preparation of land for the large variety of crops which can be sown next month. Early-maturing varieties of wheat may be sown this month. The harvesting of late-sown maize will be nearing completion, and all old stalks should be ploughed in and allowed to rot. Clean up all headlands of weeds and rubbish, and for this purpose nothing equals a good fire. Mangels, swedes, and other root crops should be now well away, and should be ready for thinning out. Frosts, which can be expected almost for a certainty this month, will do much towards ridding the land of insect pests and checking weed growth. Cotton-picking should be now practically finished and the land under preparation for the next crop. The young lucerne should be becoming well established; the first cutting should be made before the plants flower—in fact, as soon as they are strong enough to stand the mowing machine—and the cutting of subsequent crops should be as frequent as the growth and development of the lucerne plants permit. Ordinarily cutting should be regulated to fit in with the early-flowering period—i.e., when about one-third of the plants in the crop are in flower.

SUBSCRIPTIONS TO THE JOURNAL.

Subscribers are reminded that when a cross is placed in the square on the first page of the Journal it is an indication that the term of their subscription ends with the number so marked, and that it is advisable to renew immediately if they desire the retention of their names on our mailing list.

To farmers, graziers, horticulturists, and Schools of Art the annual subscription—one shilling—is merely nominal, and the charge is only imposed to cover the cost of postage. To them, otherwise, it is an absolutely free issue. Members of agricultural and similar societies who are not actively engaged in land pursuits are asked to pay five shillings a year, while the annual subscription charged to the general public is ten shillings.

Farmers particularly are urged to keep their names on our mailing list, for through the Journal they may keep themselves well informed in respect to the activities of the Department, and other matters with which they are directly concerned. Instead of sending just the annual subscription along it is suggested that, when renewing it, they do so for a longer term. For instance, five shillings would keep their names on our subscribers' register for five years. By doing this they would obviously help to reduce clerical labour as well as avoid the inconvenience to themselves of posting annually the very small sum necessary to keep their names on our mailing list.

On another page an order form may be found, and for those whose annual subscription is about due what is wrong with filling it up now and posting it direct to the Under Secretary, Department of Agriculture and Stock?

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY D. EGLINTON, F.R.A.S., AND A. C. EGLINTON.

TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

	June, 1930.		July, 1930.		MOONRISE. June. 1930.	MOONRISE. July, 1930.
Date.	Rises.	Sets.	Rises.	Sets.	Rises.	Rises.
					a.m.	a.m.
1	6.39	5.2	6.46	5.5	10.29	10.36
2	6.39	5.2	6.46	5.5	11.19	11.9
3	6.40	5.2	6.46	5.5	11.59	11.43
					p.m.	p.m.
4	6.40	5.1	6.46	5.6	12.36	12.15
5	6.41	5.1	6.46	5.6	1.8	12.49
6	6.41	5.1	6.46	5.7	1.40	1.22
7	6.42	5.1	6.46	5.7	2.12	2.1
8	6.42	5.0	6.46	5.8	2.46	2.47
9	6.42	5.0	6.45	5.8	3.21	3.36
10	6.43	5.0	6.45	5.8	4.3	4.28
11	6.43	5.0	6.45	5.9	4.51	5.24
12	6.43	5.0	6.45	5.9	5.52	6.18
13	6.43	5.0	6.45	5.9	6.35	7.11
14	6.44	5.0	6.45	5.10	7.30	8.7
15	6.44	5.0	6.45	5.10	8.25	9.0
16	6.44	5.0	6.45	5.11	9.20	9.53
17	6.44	5.1	6.44	5.11	10.15	10.46
18	6.45	5.1	6.44	5.12	11.9	11.39
19	6.45	5.1	6.44	5.12	...	...
					a.m.	a.m.
20	6.45	5.1	6.43	5.13	12.1	12.38
21	6.45	5.2	6.43	5.13	12.55	1.37
22	6.46	5.2	6.43	5.14	1.47	2.43
23	6.46	5.2	6.42	5.14	2.51	3.47
24	6.46	5.2	6.42	5.14	3.56	4.54
25	6.46	5.3	6.41	5.15	5.1	5.58
26	6.46	5.3	6.41	5.15	6.9	6.58
27	6.47	5.3	6.40	5.16	7.16	7.48
28	6.47	5.3	6.40	5.16	8.17	8.30
29	6.47	5.3	6.39	5.17	9.13	9.7
30	6.47	5.3	6.39	5.17	9.55	9.40
31	...	...	6.38	5.18	...	10.15

Phases of the Moon, Occultations, &c.

4 June	☾	First Quarter	7 56	a.m.
11 „	○	Full Moon	4 12	p.m.
19 „	☽	Last Quarter	7 0	p.m.
26 „	●	New Moon	11 47	p.m.

Apogee, 16th June, at 10.54 a.m.
Perigee, 28th June, at 1.18 p.m.

The planet Uranus will be occulted by the Moon in the early morning of 21st June, when both are high up in the north-north-east. The disappearance will take place between 4 and 5 a.m., the exact time varying according to the position of the observer.

Particular notice should be taken of the places on the horizon where the Sun rises and sets on the 20th, 21st, 22nd, and 23rd; it will be 23 degrees 26 minutes north of the east and west points, and mark our winter Solstice.

The Southern Cross will reach the meridian and be erect about 8 p.m. at the beginning of the month and about 6 p.m. at the end. It will then be 61 degrees 20 minutes, at Warwick, from the true horizon to the top star of the Cross. When at this position the part of the Great Bear known as the plough will be on our northern horizon and clearly seen, especially from places in the northern part of Queensland.

Mercury will rise at 5.18 a.m. on the 1st and at 4.55 a.m. on the 15th.

Venus will set at 7 p.m. on the 1st and at 7.19 p.m. on the 15th.

Mars will rise at 3.26 a.m. on the 1st and at 3.19 a.m. on the 15th.

Jupiter will set at 6 p.m. on the 1st and at 5.17 p.m. on the 15th.

Saturn will rise at 7.10 p.m. on the 1st and at 6.11 p.m. on the 15th.

3 July	☾	First Quarter	2 3	p.m.
11 „	○	Full Moon	6 1	a.m.
19 „	☽	Last Quarter	9 29	a.m.
26 „	●	New Moon	6 41	a.m.

Apogee, 13th July, at 11.36 p.m.
Perigee, 26th July, at 8.6 p.m.

On the 3rd the Earth will be in that part of its orbit which widens out from the Sun to a distance of 94,450,000 miles, or 1,560,000 miles more than its mean distance.

On the 5th Mercury will pass from the west to the east of Jupiter, and on the 15th it will pass the Sun.

The Moon will pass from west to east of Saturn on the 10th at 10 a.m. At 10 p.m. it will be interesting to notice that a distance of 7 degrees, or rather more than the length of the Southern Cross, will separate the two objects, which will be remarkably near the zenith at Brisbane, Toowoomba, and Warwick. On such occasions it is difficult to find any shadow to a telegraph pole.

For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S., add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhat about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

Supplement to the "Queensland Agricultural Journal," February, 1931.

VOLUME XXXIV.

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Issued by direction of

The Hon. the Secretary for Agriculture

Edited by J. F. F. REID

JULY to DECEMBER, 1930

QUEENSLAND AGRICULTURAL JOURNAL.

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QUEENSLAND AGRICULTURAL JOURNAL

VOL. XXXIV. 1 JULY, 1930. PART 1.

Event and Comment.

The Current Issue.

IN this issue, Mr. Easterby continues his interesting story of the development of the Queensland sugar industry. The first instalment of a valuable paper on the Brown Cutworm is contributed by Mr. Currie; while Mr. Roberts gives some timely advice on the right way of securing information concerning parasites. Mr. White has a useful note on the Margosa Tree and its allies. The comprehensive paper on the application of science to agriculture read by Dr. Richardson, of the Waite Institute, before the recent Science Congress in Brisbane, is also presented as a welcome contribution to current thought on rural economics. Reports on the Stanthorpe fruit industry and on the work of the Banana Experiment Station, by Mr. St. John Pratt and Mr. H. Collard, respectively, are of especial interest to fruitgrowers. Mr. George Williams has a useful description of the Thin-shelled Queensland Nut. The need of better class dairy cattle is discussed by Mr. McGrath; and sheep farming and sheep licks and their uses are Mr. Hodge's subjects for this month. A note on the eradication of diseases in pigs is Mr. Rudd's contribution. The equipment and accommodation necessary for a modern piggery is described and illustrated comprehensively by Mr. Downey. A new Journal feature is introduced under the heading of "The Young Farmer," which covers matters of topical interest to calf and pig club members. The Home and Garden Section is well supplied, and other regular features make up a well-balanced and profusely illustrated number containing a wide range of very useful information and general working notes. The July Journal will be welcomed, we feel sure, by our large and ever-extending circle of readers.

The Journal.

WITH this issue we are entering on our thirty-fourth year of publication. The *Queensland Agricultural Journal* was established in 1897; the first number was published in July of that year under the direction of the late Hon. A. J. Thynne, then Secretary for Agriculture and Stock, and the editorship of the late Major A. J.

Boyd, F.R.G.S. Essentially of a utilitarian character, the Journal has been devoted mainly to the dissemination of information of practical value to the man on the land. It has been published regularly ever since, and to date it has run into sixty-three volumes, thirty-one in the old series up to 1913, and thirty-three in the new series dating from January, 1914. Every effort has been made to maintain the high standard set by its founders and first editor. The general policy of the publication is designed on positive lines in consonance with progressive agricultural thought, development, and practice, and to be of real use and value to the working farmer. There are obvious limitations to an official publication of this character, as with other authoritative technical journals. It cannot, therefore, be looked upon in the ordinary sense as a popular magazine, or a journal of light and more or less irresponsible agricultural literature. But within those limitations, it is aimed to make it a useful, interesting, and informative publication of positive opinion that will appeal to the practical farmer. As the official organ, so to speak, of the Department of Agriculture and Stock, it is recognised that accuracy and soundness are essential if it is to preserve its authoritative character as a journal of agricultural and veterinary scientific research and record, and as a vehicle for the conveyance of Departmental advice and information.

Queensland Butter and Cheese.

BEFORE distributing the prizes won at the annual exhibition of the Queensland Butter and Cheese Factory Managers and Secretaries' Association, at the Hamilton Cold Stores, on 25th June, the Minister for Agriculture and Stock, Hon. Harry F. Walker, paid a tribute to the high standard set by the dairying industry in this State. He declared that the quality of the butter sold on the local market was the best in the world. He pleaded with dairymen to continue their good work in herd improvement; it was only by that means, he said, that Australia could hold and enhance her reputation as a dairying country. "I have been in close touch with the dairying industry for twenty-five years, and have noticed a great improvement not only as to quantity but for the most part as to quality. The exhibition to-day, I am told, constitutes a record. A record is something of which we can feel proud. To-day we are in touch with one of the principal industries of the State. Only a few years ago it was ranked as fifth or sixth. To-day it is nearly second. Moreover we find that the record is approximately 2,000,000 lb. above the previous record." Nevertheless, added Mr. Walker, the production in Queensland was not what it should be. Many people would have as the excuse the financial troubles which are besetting the world. In spite of this the primary producers had gone forward right through the year. With regard to butter there had been a big improvement in quality, but they had had to compete with many objectionable features which were to be encountered in a new country. They had to go further and continue that improvement and keep on the move. These facts were supported by the Managers' Association of Queensland, one of the finest organised bodies in Queensland, composed of men to whom he "took off his hat," and who had by industry and study put the butter-making industry on a sound footing. Queensland was forging ahead more than any of the other States. There had been much talk about the quality. But he would say without fear of contradiction that the quality of Queensland butter sent away was second to none received in the Old Country from any part of the British Empire.

Prices of Dairy Produce.

CONTINUING, Mr. Walker said that butter production had certainly suffered by the smaller prices, but thanks to the Paterson scheme and co-operation throughout the Commonwealth, the position was not as bad as it could have been. The dairy farmer had received lower export prices, and that meant that he had to lower his cost of labour and cost of production. But the time would come when the position would improve. They would all have to realise that they could not abuse the privileges of life as they had been abused in the past. Many factories, as a result, had realised the necessity and seized the opportunity of increasing and improving the methods of manufacture. Science demanded that factories should be kept up to date. Many of them by their work had sown conclusively that this was the wise policy, especially when the fraction of a penny per pound involved in the sale of a slightly inferior product was considered.

Efficiency of Queensland Farmers.

MR. Walker added that the same principle applied to the farmers. Old bails, old equipment, old and obsolete methods were passing out. Farmers to-day were realising the importance of keeping their plants up to the mark and economising in labour. While they did that they were working in sympathy with the factories. This

fact was most apparent in the quality of the dairy cattle exhibited at the various shows. In his capacity as Minister for Agriculture he had obtained increasing pleasure with the improvements which had been obvious in this direction. The cattle exhibited in the Burnett district would compare with any in the Old Country. He said that advisedly, realising what a big statement he was making. If they followed these lines they would obtain that great goal—a decrease in the cost of production. That decrease in the cost of production was the keynote of Australia's success. It was of no use talking about lowering wages until that was brought about. They had to economise.

From the farmer's point of view, economy was not the using of a poor cow when a good cow should be obtained. It cost almost as much to feed a poor cow as it did to feed a good one, and often a poor cow involved more labour because it was often harder to milk. All these were factors working towards this necessary economy, and the dairymen of Queensland had been imbued with the one object—to reduce cost—and they had done more towards that end than any other body of men he knew. Again, Mr. Walker emphasised the excellent quality of the cattle at country shows as an example.

Yet there was still a great deal to be done in order to keep pace with other States. He was big enough to acknowledge the good work done by the former Government in regard to the legislation on herd improvement. It was because certain men who had a monopoly of high-class stock had abused their privileges that the Government had been forced to reduce the subsidy on well-bred bulls from £50 to £25. If only one or two of the bull-breeders, who had this monopoly, had played the game fairly this reduction would never have taken place.

"I want you to instruct the dairymen in each of your districts to try to improve their herds," said Mr. Walker. "One thing they can all do—eliminate the wasters from the herds. But don't hold a compulsory sale and sell them all to your neighbour. Sell them to the butcher for beef."

In conclusion, Mr. Walker said that if any of those engaged in the industry had any practical or commonsense suggestions by which it could be improved, it would be their own fault if they were not brought forward and tried out. His department would be always willing to assist.

Visit of New Zealand Farmers.

ONE big event of the month, from a rural point of view, was the visit of a large party of New Zealand farmers who came to see for themselves how primary industries are developing in this State. They were also eager to exchange ideas on farming and stock-raising practice. While readily giving useful information on New Zealand conditions and methods, they, as shrewd observers, were out to acquire knowledge of our conditions of settlement and development. Their impressions of Queensland were freely voiced and were, in the main, most favourable. These will be reviewed in the August Journal.

The visitors came chiefly from the famous Canterbury Province in the South Island of the Dominion, while North Island was also strongly represented. The organisation of the tour was the last word in efficiency, and for this the Queensland Railway Department, in association with the Department of Agriculture and Stock, earned high praise from the Dominion visitors. Farmers and citizens of the districts through which they passed also assisted with typical Queensland hospitality.

The value of inter-dominion visits such as this is so obvious that it is scarcely necessary to unduly emphasise the fact. Apart altogether from the advantages on the technical side, there is the importance of our getting to know one another better, of our appreciation to each others' viewpoint, and of our understanding each others' ideas of the need of the closer association of the people of both the Commonwealth and the Dominion. After all, our destiny is identical, our difficulties are common, our national and imperial aspirations and problems are the same. The future of each country must be, from the geographical viewpoint alone, inseparable. But above that, there are our common ties of kinship. They with us possess all our cherished traditions as people of the one race, people endowed with the composite character of all the British peoples and their common genius for government and enterprise. Then there is the name we commonly share: the name coined in the Great War, when the blood of men of the Homeland and all the Overseas Dominions flowed in a common stream; the name that has become immortal; the name that is untarnishable; the name that stands for all that is great and noble in the history of our race—the imperishable name of Anzac.

THE QUEENSLAND SUGAR INDUSTRY.

By H. T. EASTERBY, Director, Bureau of Sugar Experiment Stations.

PART VII.

(b) Review of the Industry Since Federation (*continued*).

HAVING traced to some extent the history of those mills established under "*The Sugar Works Guarantee Act of* 1893," and the taking over of certain of them by the Government in 1904, a return may be made at this juncture to the earlier years of the present century. The next noteworthy landmark in the history of the industry took place in 1906, when a Royal Commission was appointed by the Queensland Government to inquire into and report upon—

(1) The number of Pacific Islanders to be deported in Queensland at the end of 1906, their present residence, localities to which they have to be deported, and the most efficient manner of repatriating them with the probable cost thereof;

(2) Whether there be in the State of Queensland any Pacific Islanders whose compulsory deportation would be inconsistent with humanity or with good faith;

(3) Whether sufficient labour for carrying on the Queensland sugar industry is likely to be available when Pacific Islanders can no longer be lawfully employed, and, if sufficient labour for such purpose is not likely to be locally obtainable the best means of supplying the deficiency.

This Commission consisted of Messrs. R. A. Ranking, Police Magistrate, W. T. Paget, M.L.A., and C. F. Nielsen, M.L.A. The inquiry lasted from April to June, 1906, and a great deal of evidence was taken from millers, canegrowers, labourers, clergymen, police officials, missionaries, labour agents, tradesmen, Pacific Island inspectors, owners of recruiting vessels, Government agents, and the kanakas or Pacific Islanders themselves.

The evidence given before this Commission was of an interesting nature. The inquiry was held practically in the middle of the transition period from black to white labour and just before the increase in bounty paid for white-grown cane had got to work. One or two of the old type of millowner was still operating at that time who had no faith whatever in white labour. One at Mackay, who passed away two or three years after, was asked if he still had faith in the sugar industry and replied, "I have no faith in the sugar industry under the conditions we are supposed to submit to now. I have no faith in white labour. . . . I do not intend to try what I consider an impossibility. . . . Stimulated by the bonus and whilst good seasons last a false confidence in the future will be created, which, on the withdrawal of the bonus and recurrence of indifferent seasons, to which we are so liable, will create disaster. The withdrawal of the kanaka will gradually force the industry into Southern latitudes less congenial to the cane, but more

Plate 1.—Kanaka Humpy at Mackay.

favourable for white labour.'' Other millowners and farmers reported favourably of their experience of white labour, and with the increase of the bounty intended to augment their white-grown areas.

Quite a number of Pacific Islanders gave evidence. Some of them had primitive ideas about marriage. One ''boy'' named Keeseree, native of Malayta Island, when asked if he had married an island woman, said he had married an aboriginal, but not in church—''No, I go along Inspector Durham and tell him I going to keep this woman and I keep her; I got one boy fifteen months old, no other pickaninny come up.'' He did not want to go back to the islands—''wanted to stop along Queensland.'' ''I sorry for the woman, I no want to leave her here, but I frightened to take her home; I frightened man Malayta kill her.''

Many of them did not want to leave for the islands. Their grievance mainly, at that time, was that they could not get work. Others said, ''Suppose me get passage money and 'box' and 'everything,' me go home. Want tobacco, knives, axe, matches, and little fellow saucepan. Must have 'box'; my countrymen make a row alonga me if me have no box.'' Another had a letter written for him to the Commission, in which he said, ''Many of us have been in this country for twenty to thirty years, and feel happy and content if we could get work, but we find the farmers refuse to engage us under the usual agreement, informing us that if they did so they would be made liable to pay our passage home, besides our wages after the latter end of this year.''

The ''box'' referred to above contained the portable and personal property of the Pacific Islander and usually played a large part in his mental outlook.

The Commission's recommendations concerning the Pacific Islanders were that the following should be exempted from deportation at the end of 1906:—

(*a*) Those Pacific Islanders introduced into Australia prior to 1879.

(*b*) Those of extreme age or suffering bodily infirmity and unable to earn a livelihood if returned.

(*c*) Those being married to, or living as man and wife with, a native of some other island than his own, so that he could not be deported without risk to the life of himself or his family.

(*d*) Those married or living as man and wife with a female not a native of the Pacific Islands.

(*e*) Those having offspring educated in the State schools.

(*f*) Those who on 1st July, 1906, and still were, registered as the beneficial owner of a freehold in Queensland.

(*g*) Those who were holders of an unexpired leasehold, compensation for the relinquishment of which had not been paid him as provided either by the provisions of the lease or by law; or

(*h*) Those continuously resident in Australia for a period of not less than twenty years prior to 31st December, 1906.

The above recommendations with the exception of (*e*) and (*g*) were given effect to in the Commonwealth Pacific Islanders Act of 1906, but a certificate of such exemption could only be issued when a Pacific Islander had proved to the satisfaction of the Minister that he was so entitled.

With respect to the supply of white labour after the withdrawal of the Pacific Islanders, a number of recommendations were made for the establishment of Labour Intelligence Bureaus, where reliable information could be obtained regarding supply and demand, and that where Crown lands suitable for closer settlement existed within or adjacent to sugar districts same should be made available in relatively small holdings for occupation by workers of limited means; that efforts be made to ascertain the probable number of unemployed within the State and in the States of New South Wales and Victoria, and to bring under the notice of such workers the nature of the employment offering, and if necessary to disseminate such information in the United Kingdom and Continent of Europe. From this it will be seen that a fear existed once the kanaka was deported that there would not be sufficient white labour to take his place, but eventually it was realised that this fear was groundless and to-day there is far more labour offering than the industry can absorb.

The number of Pacific Islanders liable to be deported at the end of 1906 was estimated at 4.500, and many people will no doubt recollect the deportation of these Islanders. They could be seen making their way to the wharves carrying all sorts of junk, old iron, hurricane lanterns, violent-coloured petticoats, &c., and in some cases trying to smuggle firearms aboard—strapped to the women's legs under their petticoats. Eventually all that were to be deported were got away and little or nothing is now heard of the old blackbirding days.

The conditions surrounding white labour at most of the mills in the early part of the century were none too brilliant, nor of a nature to induce white men to remain permanently in the service of the mills, nor were they calculated to promote the interests of the mills themselves. The men were lodged in barracks which were constructed to accommodate from twenty-four to fifty or more men. The buildings were in some cases partitioned into rooms to hold from eight to twelve or more men in a room. In others there was no such division, and as many as fifty men could be found living indiscriminately in the same building.

As usual the majority of these men were of good habits, while the minority included men of different traits. This meant that the reliable and steady workmen had no chance or guarantee of quiet or rest either day or night. The Government at once took steps as far as the Central Mills were concerned to greatly improve the conditions by increasing the buildings for the housing of the men, partitioning same off into small rooms, so that not more than two men would occupy

one room and two men known to each other could live unmolested in privacy and quiet. Verandas were built to protect the rooms from heat and enable men to sit outside, and when nights were hot to sleep outside.

In the old days the bunks or sleeping provision for workmen were of the crudest character; the bunks were fixtures, the bedding used was dry grass, cane tops or even bagasse from the mills, and in no cases were mattresses provided. All these were swept away and rooms were cleaned and fumigated, and mattresses and pillows provided, while men were provided to dust out and clean the rooms; bathrooms and showers were installed as well as reading-rooms with ample table and seating accommodation. Provisions were also made for the insurance of the men. This resulted in great satisfaction to the white labour then employed at the Government Central Mills.

Shortly after these alterations had been made an Act known as "*The Shearers and Sugar Workers' Accommodation Acts,* 1905-1906" was passed, which provided for suitable accommodation for workers, ventilation, &c. Provision for 360 cubic feet per man was to be made in respect to sleeping accommodation, proper cooking and cleansing materials were to be supplied, and receptacles provided for rubbish, &c. This Act remained in force until superseded by "*The Workers' Accommodation Acts,* 1915 *to* 1921," which repealed the former Act. Better provisions were made in this new Act for the general comfort of workers, and 480 cubic feet of air space was to be allowed for each man in sleeping-rooms. Baths and an adequate supply of water were to be furnished wherever possible. Verandas were also to be provided. It will be noticed that most of these improvements had already been put into operation at those Central Mills under Government control prior to the passing of the above Acts.

In 1907 the Australian Sugar Producers' Association was formed in Townsville, as the result of a conference in that city organised by the Chamber of Commerce. This association has played a large part in the development and protection of the sugar industry since that date.

In 1909 the first Director of Sugar Experiment Stations, Dr. W. Maxwell, retired on the expiration of his agreement with the State Government. From 1905 to 1909, Dr. Maxwell was also Comptroller of Central Sugar Mills under Government control.

The year 1910 saw the record production of sugar to that date—viz., 210,756 tons of raw sugar—the previous highest yield being in 1907 when the production totalled 188,307 tons. The rainfall in 1910 was particularly heavy. The tonnage of cane per acre in that year was exceptionally good, the average for the whole State being 19·45 with 2·23 tons of sugar per acre.

In the following year, 1911, the great strike of sugar workers took place for higher wages and better conditions mainly for mill workers, but supported by the field labour and afterwards by the waterside workers. The first mutterings of the storm were heard at the beginning of the year, and in February a demand was made on the Australian

Sugar Producers' Association in respect of the wages and conditions in the industry. Bundaberg workers asked for 30s. a week and found, and the abolition of the contract system of cutting cane was also pressed for. As time went on the fight grew very bitter. There was a Commonwealth Labour Government in office at the time and members thereof took a more active part in the quarrel than they would think of doing nowadays. The Acting Prime Minister, Mr. W. M. Hughes, who was also president of the Waterside Workers' Association, is reported to have said he would repeal the duty on sugar as a means of cutting the Gordian knot. Mr. Tudor, Minister of Trade and Customs, visited the Bundaberg district and made many strong remarks. Mr. Bamford, the Federal Labour member for the Herbert, said at Mackay that he did not think the duty would be repealed, but he warned farmers to settle the strike, and implied that if it were not settled a proposal would be introduced and probably passed by the Federal Government to build a refinery in New Guinea. A Society of Free Workers was formed in Victoria and many men from that State and Tasmania found their way to Queensland and commenced work under protection. Riots took place at Childers, and seventeen men were arrested. A tram carrying free workers was attacked by strikers at Huxley; disorderly scenes were enacted at Bundaberg and other places, and a large number of the mills were manned by the farmers. Firearms were flourished and a good deal of hot feeling was engendered on both sides. The watersiders at Cairns and Sydney, and also at other ports, took a hand and refused to handle sugar. In August a conference was proposed which resulted in certain terms being accepted, and the calling off of the strike. The terms were as under:—

(1) Wages to be at the rate of 30s. a week and keep as a minimum for adult labour at the mills. Overtime to be at the rate of time and a-quarter.

(2) Ordinary week's work to be at above rates and limited to forty-eight hours per week.

(3) Time worked at ordinary rates not to exceed nine hours on any one day.

(4) Employers and employees to meet and endeavour to arrange mutually satisfactory agreements for the following season.

(5) No vindictive spirit to be shown to the men.

(6) Strike to be called off forthwith.

There is no doubt that the men were paid on too low a scale at the time of the strike and that the accommodation was not as good as it ought to have been. The regulations under the Bounty Act in 1912 fixed the minimum rates of pay for adults at 48s. per week, without keep, and the hours of labour forty-eight per week, as has been previously mentioned, but these rates have long since been passed in the successive increases that have been made since that date by Awards of Industrial and Arbitration Courts.

[TO BE CONTINUED.]

THE BROWN CUTWORM (*Euxoa radians* Guen.).

By G. A. CURRIE, B.Sc.

PART I.

Introduction.

THE brown cutworm is the larva of a noctuid moth, *Euxoa radians* Guen. In Queensland it is distributed over all the coastal agricultural areas and extends westwards over the coastal range into the closely settled districts of the Burnett, Callide, and Dawson Rivers. It has been recorded as far west as the Great Dividing Range in the Central district, and Mungallala in the Southern district of Queensland. It is common in New South Wales and West Australia and is recorded from Victoria, South Australia, and Tasmania. In Hampson's "Catalogue of the Noctuidæ," the records outside Australia are from New Zealand, Norfolk Island, and Friendly Islands.

In the caterpillar stage it is destructive to many crops of field and orchard, the most common form of damage being the severing of the stems of seedlings and the eating of the leaves.* (Plate I., figs. 5 and 6.)

Cutworm attacks on vegetable crops on light soils are of yearly occurrence in Queensland, always more or less severe in different localities, but the widespread and devastating attacks on cotton seedlings occur only sporadically, a break of a variable number of seasons usually occurring between attacks. This is true also for widespread attacks on maize seedlings and other field crops.

The pest is, then, of seasonal and sporadic appearance, the destruction it causes being most common in the spring months in Queensland, although in summer and autumn attacks may occur if conditions favour the species.

Among economic crops attacked in the seedling stage may be enumerated beans, beetroot, cabbages, carrots, cotton, maize, peas, tomatoes, and wheat.

In the investigation, the results of which are set forth in this paper, the chief crop studied was cotton, but attacks on many crops of field and garden were examined with a view to gaining all possible evidence.

In working out the general œcology of the cutworm a special study has been made of its rate of development in relation to temperature. It is hoped that the results of this study will aid in predicting outbreaks and so in controlling them.

LIFE HISTORY.

In tracing the life history of the species, a beginning will be made at the point where the adult moth emerges from the winter pupation, and thence each successive stage will be followed.

Adult.

After breaking through the pupal coverings and the earthen containing cells, the moths push their way to the surface of the ground and hang from the under surface of leaves or pieces of débris till the wings are stretched and have hardened. They then fly off to feed on nectar from the spring flowers in the evenings and at night.

Pairing takes place at night; the moths lying quiescent during the day, well hidden under débris. When disturbed they dart along near the ground in short flights reminiscent of the flight of a plump quail,

* Certain of the references made in this article refer to plates, graphs, &c., which will appear in subsequent parts.

then pitch suddenly out of sight under cover. Their colour harmonises well with their natural surroundings and they do not stir unless very closely approached.

Oviposition.

After pairing the females are ready for oviposition, the time elapsing between emergence and pairing, and between pairing and oviposition varying with the state of the weather and presence of suitable laying conditions. Warm weather will decrease and cold weather increase these periods. Table VI. shows the time elapsing between emergence and oviposition.

Eggs are laid under suitable host plants in loose soil when conditions are favourable. Ballard[1] found that a slightly moist soil under low growing weeds was a favourite position. It has now been found that when moths are ready to lay and host plants are present, they will also oviposit in fairly dry soil, and that a very wet soil is repugnant to them. When the soil is wet they tend to scatter the eggs over the host plant itself, contrary to their normal habit of laying a batch of eggs all together just under the loose surface of the soil.

The position chosen by the female for oviposition is important, as it has a bearing on control methods. In 1926, during the October and November attack, no eggs were found under cotton seedlings but all were found under low-growing shady host plants, particularly Bullhead (*Tribulis terrestris*). In 1924, however, eggs of *Euxoa radians* were found under cotton seedlings near Rockhampton, but it was not stated whether there were weeds associated with the eggs or not. The importance of the point is that if eggs are laid under the seedlings, such forms of control as barrier furrows round the fields are useless.

It would appear that where bushy plants of bullhead are available and the soil under them loose, the moths prefer them to anything else for oviposition. If the season is too early for such bushes to have developed, and if seedlings of cotton are available in loose soil, it is probable that the moths flying in from the headlands, or from surrounding vegetation where they shelter during the day, would lay under the seedlings in the first rows they happen to cross. More evidence is necessary on this point before it can be definitely determined.

In the laboratory eggs were almost invariably laid at night, but on one occasion oviposition was actually witnessed about 9 a.m. A female at her last lay and nearly exhausted was observed under the pigweed (placed there for cover) in the act of laying. She squatted on the loose soil surface and pushed the tip of her abdomen backwards and downwards into the loose soil. A slight convulsive movement of the abdomen marked the passage of an egg to the ovipositor. The tip of the ovipositor was then pushed downwards till it touched the false bottom of the container over which the loose soil had been scattered. The egg was placed against this false bottom and adhered to it by some cementing fluid. The wings were half extended and quivered gently all the while, scales being shed on the surface of the ground. After each egg was laid the body was moved slightly forward or sideways so that the eggs touched, but overlapped very little.

Eggs are laid in batches, generally one batch each night until the death of the female. The dead body of the female was frequently found in the field, lying over her last batch of eggs.

Table I. gives the numbers of eggs laid by some of the females reared in the laboratory.

The average number of eggs laid by this group is seen to be 500, but dissections of females caught in the field have yielded up to 1,200 eggs in the ovaries.

TABLE I.

Euxoa radians GUEN., NUMBER OF EGGS LAID BY FEMALES REARED IN LABORATORY.

Average Temperature, 22·7° C.		Average Temperature, 22·7° C.		Average Temperature, 24·5° C.		Average Temperature, 24·5° C.		Average Temperature, 24·5° C.		Average Temperature, 26° C.		Average Temperature, 26·7° C.	
Moth Adult, 6th December, 1927.		Moth Adult, 10th December, 1927.		Moth Adult, 26th December, 1927.		Moth Adult, 26th December, 1927.		Moth Adult, 28th December, 1927.		Moth Adult, 30th January, 1928.		Moth Adult, 11th February, 1928.	
Date of Lay.	No. of Eggs.	Date of Lay.	No. of Eggs.	Date of Lay.	No. of Eggs.	Date of Lay.	No. of Eggs.	Date of Lay.	No. of Eggs.	Date of Lay.	No. of Eggs.	Date of Lay.	No. of Eggs.
1927. 15th Dec. ..	23	1927. 17th Dec...	250	1927. 31st Dec. ..	63	1927. 31st Dec. ..	105	1928. 4th Jan...	61	1928. 3rd Feb...	569	1928. 14th Feb...	161
16th Dec. ..	24	18th Dec...	135	1928. 1st Jan. ..	224	1928. 1st Jan. ..	153	5th Jan...	123	..	..	15th Feb...	184
20th Dec. ..	137	19th Dec...	38	2nd Jan...	72	2nd Jan...	288	6th Jan...	139	..	..	..	..
21st Dec. ..	66	..	..	3rd Jan...	180	3rd Jan...	65	7th Jan...	218	..	..	..	..
..	..	..	..	4th Jan...	7	..	..	8th Jan...	147	..	..	..	..
..	..	..	..	..	..	..	..	9th Jan...	65	..	..	..	..
Totals ..	250	..	423	..	546	..	611	..	753	..	569	..	345

The average number of eggs laid by this group is seen to be 500, but dissections of females caught in the field have yielded up to 1,200 eggs in the ovaries.

Length of Adult Life.

As can be seen from Table I., the length of time between emergence of the adult female and oviposition varies with the temperature. The length of life of the adults varies in a similar way.

In the laboratory the length of life of males varied from about six days at an average temperature of 26 deg. C. to about twelve days at an average temperature of 22·5 deg. C.

The females were more variable, and their length of life varied from five to seventeen days, having an average of eleven days for forty individuals. It would appear that in the field females could live for a longer period if they were unable to oviposit owing to unfavourable conditions. They died immediately after their last lay, however.

Some females in the laboratory were found to lay abnormally large eggs which were invariably infertile. Others were swollen with eggs but failed to oviposit. Dissection showed that these females contained collapsed and unchitinised spermathecæ in strong contrast to the dark-coloured, firm, and highly chitinised spermathecæ of females laying normal fertile eggs.

Egg.

Laid under cover, the eggs are protected to a considerable extent from dessication, too great heat, and natural enemies. Exposure to direct sunlight will kill the eggs and an average shade temperature of 37 deg. C. is fatal to them in time. They hatch in from three days upwards. (Graph II. (D).)

In all batches of eggs experimented with it was observed that either the percentage fertility was complete (100 per cent.) or that the whole batch was infertile. In the field no infertile eggs have been seen.

Larval Instars.

When ready to emerge the tiny larvæ use their strong mandibles to break down a portion of the egg shell large enough to allow egress. They eat this portion of the shell but have not been seen to eat any more of it.

Hatching takes place at any hour, and the emerging larvæ are very active, moving with a looping gait like geometrid larvæ. In keeping with this habit the anterior two pairs of abdominal legs, or "larvapods," are reduced in size.

Very little, if indeed any, silk spinning is done in this instar. When disturbed on a food plant the small larvæ drop straight to the ground without putting out a silken thread, and then lie curled up amongst the débris. The reduced state of the spinneret, as shown in Plate VII., fig. 3, is in keeping with the absence of extensive silk spinning.

The larvæ are extremely active for some time after hatching, moving rapidly, and usually not feeding for some little time. They are positively phototropic and negatively geotropic, moving outwards and upwards from their place of origin. After their first burst of feverish activity they settle down on a convenient host plant to feed, but the effect of their first set of tropisms is to aid in their dispersal from the point of origin, although many individuals may remain on the plant under which they have been hatched.

For the duration of this first urge, food plants may be passed without any display of interest, but when the first urge is satisfied, feeding is

immediately resorted to. Owing to the relatively large size of the hollow setæ of this instar, and the light weight of the body, the wind can easily catch up the larvæ and aid in their dispersal.

During the first instar, and growing progressively less throughout the later instars, is a tendency for the larvæ to congregate together on a leaf when feeding; small groups being found with their bodies touching along their length. Tender succulent food only can be eaten by the small larvæ, and in the case of cotton, the cotyledons form their first food.

When breeding caterpillars in the laboratory it was found necessary to cover the tops of the breeding jars with fine cloth when hatching of eggs was in progress, as the larvæ on emerging, immediately made for the top of the jar. After about two days this cover could be dispensed with as the larvæ normally did not again attempt to climb out of the jar, hiding during the day in the soil provided for them, or under cover of some débris on the bottom, and feeding during the night. For the rest of their larval lives, except in cases of disease or parasitism, the larvæ are positively geotropic and negatively heliotropic.

When feeding on cotton cotyledons the young larvæ feed on the underside, eating through to the upper epidermis, which, however, they often leave intact. The upper epidermis then sinks into the hollow space underneath, giving the characteristic pitted appearance of the work of young larvæ.

The second and subsequent instars up to the sixth, feed by night and hide by day in the soil, burying themselves deeper as they increase in size, and the bigger ones following the true "cutworm" habit of cutting through the stems of seedlings and pulling the leaves down to the ground for consumption. The younger stages usually leave the soil and climb on to the host plant to feed while the elder ones cut down the leaves and pull them into the soil, thus enjoying, even while eating, the protection which the soil affords.

At each moult there is a pre-moult cessation of feeding and period of rest, followed by the moult. The newly moulted larva has always a very light colour for some hours after moulting, but later becomes darker.

In all there are six instars, the duration of each according to temperature, being shown in Graphs II. and III.

The final instar larva grows to a greater size under cool than under hot conditions, and the moths from the larger larvæ have a larger egg capacity than from the smaller. The consequences of this will be considered in the general œcological discussion.

As the larvæ increase in size their capacity for food increases rapidly, so that the ravages of the pest soon become evident. On hatching the larva weighs only about ·002 grams and when full grown about 1·4 grams, an increase of 700 times, which argues a rapidly increasing power for destruction.

When the larva becomes full grown, it cuts its way into the ground, the depth varying with the hardness of the soil. In loose soil it goes to a depth of 3 inches and in hard soil from ½ to 1 inch. An earthen cell is built and the larva enters a resting pre-pupal stage.

No silken cocoon is spun, although it appears probable that some cementing material is used in building the walls of the earthen cell.

This cell has waterproof properties and a cohesive strength, due to the cementing material.

During the pre-pupal stasis the larva shrinks and slowly assumes the tapering shape of the pupa. The gut is cleared of fæces and there is a concentration of the protoplasm by the passing off of moisture.

The following tables show the daily loss in weight of full-fed larvæ during this stage:—

TABLE II.

DAILY LOSS IN WEIGHT OF FULL FED LARVÆ OF *Euxoa radians* DURING PRE-PUPAL STASIS.

Series 1.

Date.	Weight in Grams.		
	Number 1.	Number 2.	Number 3.
1928.			
29th January	1·4	1·3	1·5
30th January	·85	·8	1·2
31st January	·67	·645	·74
1st February	·505	·55	·63
2nd February (pupated) ..	·39	·41	·52
3rd February	·39	·41	·46
4th February	·39	·41	·46
21st February	·39	·41	·46
	Emerged as adult moths, 21st February, 1928.		

Series 2.

Weight of five full-fed caterpillars = 6·2 grams = 1·24 grams per caterpillar.

Weight of five caterpillars shrunken at pupation = 2·125 grams = ·425 grams per caterpillar.

Loss in weight, Series 1 = 70 per cent.

Loss in weight, Series 2 = 66 per cent.

Average loss in weight = 68 per cent.

Pupa.

When the pupa is fully formed under the old larval skin, there is a splitting of the latter along the dorsum of the thorax and the humped up thorax of the pupa protrudes. A rhythmic movement of the pupa then slips the exuvium caudad, and in this process the cremaster comes into play. At each upward movement of the tip of the abdomen, the hooks of the cremaster engage in the loose exuvium. The tip of the abdomen is then swung backwards and downwards, the hooked cremaster pulling the exuvium with it. The hooks then disengage, the tip of the abdomen is again raised for another pull, and so the exuvium is gradually brought clear of the pupa.

The pupal skin is a pale amber colour immediately after moulting, but darkens to a rich brown after a few hours. As pupal development proceeds the colour steadily darkens and when near completion the dark markings of the wings are discernible through the pupal skin, as also are the legs and haustellum. When development is complete the adult

moth emerges from the cocoon and pupal cell and flies off to recommence the cycle.

The times of development for each stage are fully dealt with in another part of this paper.

Seasonal Life History.

The individual life history having been dealt with, the seasonal life history can now be traced. The spring brood originating from the over-wintering parents has been most destructive in the cotton areas, about October. In November and early December there is sometimes a recrudescence of damage from the second brood of the season, but the mid-summer brood is seldom very destructive unless conditions are particularly favourable to the species.

On the coastal areas damage may occur all the year round, even in winter, but west of the coastal range where severe frosts are experienced, damage does not occur in the winter months. Moths have been captured during each month of the year on the coast, and in favourable areas inland breeding is continuous, although a dragging out of the life history in the cold season takes place.

Broods are continuous throughout the year, except that in the winter months only the pupæ in the ground survive in areas of severe frosts, as not only are the larvæ which may be present checked in development, but their food plants are killed off. It so happens that no feeding stage can persist in a severe winter, but the pupæ in the ground survive. The pupal instar is lengthened, but there appears to be no periodicity about it, only the direct effect of continuous reaction to temperature. This lengthening of the pupal instar allows it to be carried over until rising temperatures and spring showers bring out both itself as adult moth, and host plants to support its offspring.

The length of life of *Euxoa radians* from the hatching of an egg to the time when the caterpillar has become an adult female moth, mated, and laid eggs, is shown below:—

At 20 deg. C.	about 106 days
At 25 deg. C.	about 65 days
At 30 deg. C.	about 52 days

The proportion of males to females is about even. In one group, emerging from the pupal stage November and December, thirty-nine were males and thirty-seven females.

[TO BE CONTINUED.]

INQUIRIES CONCERNING PARASITES.

DIRECTIONS TO STOCKOWNERS.

By F. H. S. ROBERTS, M.Sc., Veterinary Entomologist and Parasitologist.

1. Internal Parasites—Worms.

(*a*) The specimens should be forwarded in spirits or formalin. A 10 per cent. solution of formalin is preferred. This may be prepared by adding three volumes of water to one volume of commercial formalin. On no account should the specimens be sent in water only, as the worms will quickly decompose without any preservative.

(*b*) When possible a number of specimens should be sent in order that both males and females be represented.

(*c*) Care should be taken in packing the container for postage. The postal regulations specify that sufficient packing be used to absorb any liquid that may escape through the container leaking or being broken.

(*d*) Accompanying the specimens full particulars of the following should be forwarded:—(1) The name of the animal in which the parasites were found; (2) the locality and date; (3) the nature of the country on which the animal had been accustomed to feed; (4) the name of the internal organ infested, whether the lungs, stomach, intestine, liver, &c.; (5) whether the parasite was lying free, attached, or in nodular form; and (6) the condition of the animal affected.

2. External Parasites—Flies, Lice, Fleas, Mites, and Ticks.

Flies.—(*a*) When a good series is obtainable, some specimens may be sent in spirits; the remainder in small boxes packed securely in position with cotton wool and soft paper (tissue paper). If only one specimen is forwarded it should be packed in cotton wool or tissue paper. Care should be taken in packing the specimen securely to prevent any movement, as this would tend to destroy bristles and other small structures useful for the identification of the species. Maggots should be sent alive packed in sawdust or cotton wool, the packing being slightly damped.

(*b*) Fleas, mites, and lice are best forwarded in spirits.

(*c*) Ticks are preferred alive, though if necessary they may be sent in spirits or formalin. Partly engorged and unengorged specimens are preferred. The males are required and these are usually to be found wandering about in the vicinity of engorged and attached females. A good series of specimens representing both adults and young is desired. Care should be taken in detaching ticks as headless specimens are useless for identification purposes. A small drop of kerosene applied to the tick will cause it to fall off the host in a very short time. A good steady and patient pull will also yield good results.

(*d*) In all cases the host, locality, type of country, and part of animal infested should be noted.

THE MARGOSA TREE AND ITS ALLIES.

By C. T. WHITE, Government Botanist.

Considerable attention has been directed recently to the possible use of the oil from the seed of the Margosa tree as a general insecticide and germicide, particularly in relation to the blowfly pest in Australia, so a few notes on it may not be without interest.

Azadirachta indica is a native of Ceylon and India. In the former country it seems to be universally known by its Portuguese name of "Margosa," and the oil from the seed is held by the natives in great repute as an external application for sores, rheumatism, &c. It is a tall tree allied to our White Cedar, and in India and other parts of Asia is widely planted as a shade and ornamental tree. It is not found wild in Australia, and I do not know that it is to be seen growing in any Australian gardens, though it would seem strange if it has not been introduced. It is possible it is growing in some places and has been passed by as an ordinary White Cedar.

The tree is sometimes known as *Melia Azadirachta,* but most botanists now keep the genus Azadirachta as distinct from Melia, though the distinctions are but slight. As at present understood the genus consists of but two species, *Azadirachta indica* of India and Ceylon and *A. integrifolia* of the Philippine Islands.

Melia azedarach, of which our White Cedar has been considered by some botanists to be merely a variety as now understood, is considered to be confined to Northern India, Persia, and China. It is commonly known as the Indian or Persian Lilac or Bead tree.

Melia dubia is the name now generally accepted for the White Cedar of the rain-forests (jungles, brushes, or scrubs) of coastal Queensland and Northern New South Wales. In addition to Australia, however, it has a wide distribution through tropical Africa, tropical Asia including Southern China, Formosa, and the Philippines through the Malay Archipelago and New Guinea to Australia.

The tree is sometimes known as *Melia composita,* but the specific name *dubia* has nearly forty years priority. As mentioned above the Australian tree has been considered a variety of *Melia azedarach* and named *Melia azedarach* var. *australasica,* though it would seem preferable to keep it as above outlined. The seed is not known to contain any oil, but the matter is one worthy of investigation.

APPLICATION OF SCIENCE TO AGRICULTURE.

By PROFESSOR A. E. V. RICHARDSON, M.A., D.Sc., Director, Waite Agricultural Research Institute.

In an address delivered to the Australian and New Zealand Association for the Advancement of Science, Brisbane, 2nd June, 1930.

The meeting of the Australian and New Zealand Association for the Advancement of Science in the Capital City of a State with such vast agricultural and pastoral resources as Queensland formed an appropriate occasion for discussing the importance of the primary industries to national welfare, and the desirability of developing these industries to the utmost extent attainable.

The discussion of this question is appropriate because the agricultural community is being urged on all sides to increase the production of exportable commodities in order to alleviate the financial difficulties which are temporarily confronting the Commonwealth.

In this paper Dr. Richardson demonstrates the relationship of scientific research to the development of agricultural practice, and how further development in these industries depends upon the application of scientific knowledge.

IMPORTANCE OF AGRICULTURE.

THE agricultural and pastoral industries provide the food supply of the nation, the raw materials of the manufacturing industries, and are the pillars on which the prosperity of the Commonwealth rests. The total value of production from all sources in Australia, according to the 1927 Year Book, was £430,000,000 sterling, of which the primary industries, excluding mining, contributed £262,000,000, or roughly 60 per cent.

But, quite apart from its material importance, the agricultural industry has a special significance to national life. Agriculture is one of the great permanent industries. As Sir Robert Grieg states, "Coal seams come to an end, and the discovery of new sources of energy changes the value of coal. Advances in physical science may, by creating new industries, destroy old ones. Gold, silver, copper, and lead mines have a relatively limited life in the history of the nation, and every ton of ore raised leaves the mine so much the poorer. But agricultural wealth, the capacity to produce every year the food and clothing without which life ends, always has been and always will be the foundation of national and world wealth."

Moreover, the conditions of country life are peculiar in their contribution to health, their stimulus to personal initiative, and their fostering influence on that spirit of individualism on which rest free institutions and democratic government. Rural populations exert an important influence in the mental outlook and physical vigour of the race.

Furthermore, the business of farming, dealing as it does at every step with the subtlest laws of nature, is capable of indefinite improvement as soon as and as rapidly as the findings of science are applied to its affairs.

Agriculture has been referred to as the oldest of the arts, and the most recent of the sciences. In the older countries of the world agriculture has been an art based upon experience and handed down from father to son by tradition. Even to-day a considerable part of what the farmer needs is practical experience, but the other part—the scientific side of his business—is becoming more and more important. If we are to keep pace with the progress of agriculture in other countries, agricultural science must subtend an ever widening angle to agricultural practice.

Finally, agriculture is an enormously productive industry, and money expended on its development by research and education gives a liberal return on the investment. Every day in the year the aggregate production of new wealth from the soil in Australia exceeds £500,000 sterling, or nearly £200,000,000 sterling per annum. If, through the promulgation of better methods of feeding and breeding dairy stock, the production of butter fat could be increased by the small amount of 10 lb. per cow, it would mean an increase in annual production of approximately £2,000,000 sterling. Each bushel of wheat added to the wheat yield of Australia results in a permanent

addition of £3,000,000 to the national income. Every pound of wool that can be added per sheep by improved nutrition or elimination of pests, would add at least £5,000,000 per annum to the national income. Every insect and fungus pest we learn to control adds enormous wealth to the Commonwealth.

It is because of the recognition of the unique importance of agriculture to the national welfare that other countries, notably the United States of America, Canada, and South Africa, and more recently Britain, have established and maintained at national expense institutions for fostering research and development in agriculture.

If the development of agriculture were merely the concern of the farmers, they might be left to provide it for themselves. But in the final analysis, the development of agriculture is of national importance, and public funds are therefore freely appropriated by these countries for its orderly development.

The public support of scientific research in agriculture on all these grounds should, therefore, be accorded freely with understanding and with patience. This is the era of the application of science to industry, and its triumphs have been witnessed in our time in the remarkable development of transport, aviation, wireless, engineering. The era of the application of science to agriculture is fast approaching, and when it comes the returns will be vastly in excess of the money invested in it.

SCIENCE AND PROGRESS.

Before considering the possible results of the application of science to agriculture, let us consider brifly the bearing of science on human progress and industrial development.

> "The progress of civilisation very largely depends on the development of science and its application to all phases of life—to the everyday problems of education, health, transport, housing, land settlement, and agriculture. If substantial progress is to be made in these fields it can only be along a road of which the foundations have been laid by scientific thought and research."—H.R.H. the Prince of Wales, B.A.A.S., 1926.

"Real progress," said Sir William Ramsay, "consists in learning how better to employ energy, how better to effect its transformation."

The achievements of science in this direction have enormously increased the productive power of men, and have lessened human drudgery. The development of the steam engine, the gas engine, the internal combustion engine, the electric dynamo, the utilisation of electric energy in manifold forms, the harnessing of the energy of falling water and its conversion into electrical and other forms of energy, and the concentration of chemical energy in explosives have immensely increased man's power over nature.

The great revolutionary changes in our industrial life—the great inventions which have altered the character of our civilisation—have arisen not as an effort to achieve results of immediate practical importance, but as a result of patient and persevering pursuit of knowledge for its own sake.

The invention of the electric dynamo was rendered possible only by the researches of Faraday, who revealed how the armature of a magnet swung round mechanically in a magnetic field and gave rise to an alternating current of electricity.

The X-ray tube arose as a result of the investigation of the nature of the electric discharge in gases, and not as a result of consciously directed effort to discover a means whereby we might, as it were, see through a brick wall or examine the internal structure of the living body.

The invention of the thermionic valve which led to the recent remarkable development of wireless, and the linking up of London and Melbourne by the wireless telephone, was rendered possible only by previous researches on the emission of electrons from hot bodies.

In the domain of biological science and preventive medicine, the achievements have been equally remarkable.

It was Pasteur who said that "In our century science is the soul of the prosperity of nations, the living source of all progress. What really leads us forward are a few scientific discoveries and their applications."

The work of Pasteur, indeed, is a striking exemplification of his own statement. His classical researches and discoveries on the cause of fermentation inaugurated a new era in the wine-making, brewing, and dairying industries, because he was the first to establish a controllable cause for fermentation and putrefaction, and for the diseases of wine, beer, and milk, which had from time immemorial baffled all attempt at cure.

The application of Pasteur's discoveries on putrefaction and fermentation to surgical operations at the hands of Lister revolutionised surgical practice, and banished for ever the torture of gangrenous wounds from the surgical wards of our hospitals.

The pébrine disease which first attacked the silkworms of France in 1849 caused the annual revenue of the silk industry to fall from 130,000,000 to 8,000,000 francs. The silk industry was ultimately saved by his scientific labours, for he was able to establish the cause and method of control of the disease.

Pasteur gave us the first definite knowledge of the bacterial origin of disease, and the production of immunity by vaccines. His application of this principle to the control of anthrax and hydrophobia was the culminating glory of his life.

Koch, in 1876, had shown how to isolate the organism of anthrax and cultivate it in pure culture outside the body. Pasteur confirmed these results and made an even more important discovery, namely, that by growing successive and continued artificial cultures the virus or poison of the organism became weakened or attenuated, and that if this weakened virus or poison is injected into the animal only a slight attack of the disease occurs and the animal is rendered immune from further attacks. The virus becomes a vaccine.

Many millions of sheep and cattle have since been treated for anthrax all over the world, and the rate of mortality has been reduced to less than 1 per cent.

As to the money value of these discoveries, Huxley has estimated that it was sufficient to pay the whole cost of the war indemnity paid by France to Germany in 1870.

The Pasteur Institute was founded as a national memorial to the illustrious man whose name it bears. That restless, tireless genius had saved France millions in treasure, and hundreds of thousands of lives. The silk industry, wine industry, dairying industry, stock-raising industry, medicine and surgery had felt the impress of his mighty hand.

Scorning the rich rewards which might have been his had he chosen to patent his discoveries, Pasteur deserved well of his country. The people understood and honoured him as few men have been honoured while they were alive. When one of the great newspapers opened a subscription list for a splendid memorial for an institution wherein Pasteur and his disciples might carry on their work under the most favourable conditions, the response was instantaneous. There was hardly a humble home in France which was not indebted in some way to Pasteur—there was hardly a home from which a subscription did not come. The wonderful Pasteur Institute was the result. Research workers come there now from every part of the world, and while the work of the Institute is now highly technical, it may perhaps be said that nowhere has so close an approach been made to the solution of the most intimate problems of hygiene, health, and of life.

Scientific research is not a luxury. From the purely materialistic point of view it is probably the cheapest form of investment that can be made. Germany in the nineteenth century provided a classic illustration of the manner in which a country, comparatively poor in natural resources, can, by the organised application of scientific research, grow rapidly in wealth and power.

When Schleswig-Holstein was torn from Denmark the Danes developed their systems of education and agricultural research with such success that they have become the world's object lesson in agricultural advancement.

Sir Richard Gregory, at the Capetown meeting of the B.A.A.S., said that "creative science, purposeful invention, and skilful labour are the three legs of a tripod on which industrial development rests. There can be no stability unless each foot stands firmly on the ground of common interest, and each bears its share of the structure supported by the combination. Without this triple alliance of the scientific investigator, alert manufacturer, and skilled operative, no nation can expect to be in the van of modern progress."

We are living in an age of rapid change and ever-growing complexity, and any industry or any country that is content to stand still is quickly left behind in the march of progress.

SCIENCE AND AGRICULTURE.

The foundations of agricultural science were laid long before governments took any part in its development. They were laid by men who pursued research for the love of knowledge—by such men as Liebig, Lawes, Kuhn, Pasteur, Mendel, Hellriegel, and many others. The past triumphs of agricultural research are familiar to many

of you, but in a gathering of this nature I may be pardoned if, for purposes of illustrating their economic bearing, I give a few examples of the far-reaching effects of the scientific discoveries of the chemist, the biologist, and geneticist.

The first great triumph was the introduction of artificial fertilisers, notably superphosphate, sulphate of ammonia, nitrate of soda, and potassic salts. These have added greatly to the productiveness of soils all over the world, and increased the output not only from crops but also from grasslands.

Superphosphate is of special interest to us because of the general deficiency of our soils in available phosphoric acid, and the extraordinary response which soluble phosphates give on wheat and grass lands.

Liebig was the first to draw attention to the fact that the insoluble tribasic phosphate in bones and rock phosphate could be converted into water soluble phosphate by treatment with sulphuric acid. In his report to the British Association in 1840 he suggested that this would be a suitable form in which phosphoric acid might be applied to crops.

Sir John Lawes, of Rothamsted, was one of the first to profit by this discovery, for he not only tested the efficacy of dissolved bones on his famous experimental plots, but began the manufacture of superphosphate from rock phosphate in 1842, and thus laid the foundation of the large fortune which he subsequently made and devoted to agricultural research. He established the Rothamsted Agricultural Experiment Station, one of the oldest and most famous agricultural research stations in the world, and left £100,000 for its endowment.

Since then the practice of using superphosphate has spread to every agricultural country. In no part of the world are phosphates so universally used as in Australia. Soluble phosphates are of special value to Australia, partly because of the common deficiency of Australian soils in phosphates, but also because it has been demonstrated that the application of soluble phosphates lowers the transpiration ratio and the water cost of producing dry matter in cereals and pasture plants, and thus increases the effectiveness of a limited rainfall.

The economic results to Australia of this simple discovery are difficult to assess, but for the wheat crop alone it is safe to say that its general use has increased the average yield of Australia by at least three bushels per acre—an increase worth annually £7,500,000 sterling to the Commonwealth.

Nitrogenous fertilisers are essential for the growth of crops and grassland in regions of heavy rainfall. In 1898, at the British Association for the Advancement of Science, Sir William Crookes predicted that the supply of natural nitrogenous fertilisers would soon become exhausted, and suggested the possibility of manufacturing these from the inexhaustible supplies of nitrogen in the air. Synthetic nitrogenous fertilisers are now manufactured in enormous quantities in Germany and Britain, and are being extensively used for intensifying producton from grasslands in Europe.

Pasteur's Work.

The achievements of Louis Pasteur have already been referred to. Some of his most fundamental and far-reaching studies had their roots in agricultural problems, and few men have had a more vital influence on the development of science in relation to agriculture. It is only necessary to recall his studies on fermentation in wine and vinegar making, on the serious troubles of silkworm culture, and on the several diseases of live stock, from which resulted some of his most epoch-making advances in science.

In discovering the cause and method of control of the deadly anthrax in stock he made one of the most fundamental additions to the etiology of disease; and in staging an extensive and successful experiment on anthrax under the auspices of the Melun Agricultural Society he compelled universal acceptance of his theory of protective vaccination, one of his greatest triumphs. His work on fermentation and on diseases of stock led to epoch-making contributions to bacteriology and immunology, and opened up a new world in combating infectious diseases.

Mendel's Law of Inheritance.

In 1865 Gregor Mendel, a monk of the Monastery of Brünn, in Austrian Silesia, formulated a law of inheritance which may be regarded as one of the greatest of biological discoveries. By his classical researches on the garden pea he was able to

show that when two distinct types of plants were hybridised the unit characters of each species were independently inherited, and that this was brought about by a segregation of the germ cells carrying the characters. Later researches have demonstrated that the chromosomes of the germ cells are the carriers of these heritable factors—the so-called genes of the biologist.

The presence of a small number of factors or genes carried with it the possibility of an enormous range of variation. Thus, with ten pairs of characters, there would be no less than 2^{10} or 1,024 distinct pure breeding forms produced by hybridisation, all of which could be isolated and raised in pure culture. Thus the almost infinite variety in Nature could be accounted for by assuming the presence of a comparatively small number of genes in the parent germ cells.

The Mendelian conception of unit characters, based on specific factors, transmitted in accordance with a definite scheme of inheritance, provided a scientific basis for breeding and a starting point for the modern science of genetics. By the recombination of the desirable characters contained in several varieties of the same species of plant, the plant breeder is now able to produce improved varieties of farm crops with a reasonable degree of certainty.

The principles have been applied with marked success with many varieties of crop plants, especially with wheat, and it is safe to say that the application of Mendel's principles to wheat breeding has added millions sterling to the wheat fields of the world, and has pointed the way to the ultimate production of varieties resistant to disease.

One of the earliest and most successful wheat hybridisers was William Farrer, of New South Wales, who, working in the Federal Capital Territory, produced Federation and many other prolific varieties of wheat. The Federation variety became so popular that Farrer may be said to have changed the colour of the Australian harvest fields from golden yellow to dull bronze—the colour of his own Federation wheat. The work of this pioneer wheat breeder, whose monument is to be seen in nearly every ripening wheat field of Australia, has resulted in increased production amounting to millions of bushels annually.

Similarly, the production of Marquis wheat in Canada by Dr. Saunders has revolutionised wheat culture in Canada, and it is estimated that the increased production of wheat in Canada due to this variety amounts to millions sterling per annum.

The mantle of Farrer has fallen on others, and thanks to their efforts almost the entire wheat belt of the Commonwealth is now sown with varieties which were unknown to the wheatgrowers a generation ago.

Breeding for Disease Resistance.

Apart from its application in the production of new and prolific varieties of wheat, there is reason to believe that the problem of producing disease-resistant types of crop ultimately will be solved by further applications of the Mendelian principle of inheritance.

An interesting illustration is the production of rust-resistant wheats. The estimated damage due to rust in the United States in 1916 was £60,000,000. In the same year the loss in New South Wales was estimated at £2,000,000. Careful research has established the fact that there are a large number of physiologic forms of rust. Stakman and others have shown that there are no less than fifty-five distinct biologic forms of rust, and that certain varieties are immune to some forms of rust and susceptible to others. Of these species of rust Australia has six indigenous forms, and one form which has been found in other countries.

Dr. Waterhouse, of Sydney University, has shown that the variety Thew was resistant to three of these biologic forms, whilst another variety, Canberra, was resistant to the remaining three. By crossing these two varieties he was able to produce a new variety, Euston, which was resistant to the six indigenous strains of rust. An American variety, Webster, was shown to be completely resistant to the introduced species of rust, and crosses between Euston and Webster have been made which now promise to be completely immune from the seven species of rust now found in Australia.

The problem of breeding rust-resistant varieties in Australia is much simpler than in other countries because of the comparatively few biologic forms of rust. The solution of the problem of rust-resistant varieties of wheat for Australia appears to be within sight, thanks to the patient research work of Dr. Waterhouse.

The Artificial Transformation of the Gene.

Most geneticists will agree that mutation forms the chief basis of evolution. Mutations have been a fertile source of improved races of plants. The history of the domestic cabbage and its cousins may be taken by way of illustration. When Linnaeus classified the plants of the world he gave the same specific name to the cabbage, cauliflower, kohl rabi, kale, Brussels sprouts, and to a wild plant inhabiting the Mediterranean region—namely, *Brassica oleraceæ*. The origin of these various forms of *Brassica oleraceæ* is not known, but there is little doubt that they arose from a common progenitor somewhat similar in type, but more mutable in character than the wild type of the Mediterranean.

All vegetative parts of the original species were evidently highly variable and mutable, for the cauliflower arose from a change in the inflorescence, the cabbage from a change in the leaf. Similarly, the mutation of the leaf buds, stem, and root produced respectively the Brussels sprouts, the kale, and the khol rabi. These mutations, as they appeared, were seized upon by man and perpetuated by cultivation.

Unfortunately, these discontinuous variations, or sports, caused by the mutations of the gene, occur with extreme infrequency under ordinary conditions. Hence the practical breeder has to be content with the recombination of the unit characters in his plants and animals by hybridisation or crossing, supplemented by an occasional mutational windfall, which gives him a basis for further development. There has been a widespread desire on the part of biologists to gain some measure of control over these mutational changes, and even to induce them artificially.

Quite recently Dr. H. Muller, of the University of Texas, appears to have demonstrated that in Drosophila gene mutation could be brought about by relatively heavy dosages of X-rays. Several hundred mutants were obtained in this species by this means, and they have proved to be stable in their inheritance for at least three generations.

Comparison of the mutation rates of irradiated and control Drosophila showed that in one case the mutation rate under irradiated conditions was 15,000 per cent. greater than in the untreated controls. Just what has taken place in this interesting experiment is difficult to say without further investigation, but if the X-rays has brought about the artificial transmutation of the genes—the bearers of heredity—and if it can be shown that gene mutation in plants or domestic animals can be induced by similar methods the economic importance of the discovery can hardly be overestimated.

Control of Fungus Pests in Plants.

From time immemorial the cultivated crops have suffered from the ravages of fungus pests. Every country had a few, and with improvement in transport diseases were liable to be carried from one country to another. Moreover, under cultivation plants were more liable to disease than in the wild state.

The most destructive crop disease in the history of mankind was the ordinary potato blight (*Phytophthera infestans*). This was a native of South America and when it first reached Ireland, in 1840, it swept the country with all the vigour of a new pest, and caused widespread famine throughout Ireland. Once the disease appeared the farmer was helpless; there was no cure in sight. As Sir John Russell has said, "Of all the tyrants Ireland ever had the potato blight was the worst; it cost thousands of lives, untold suffering and misery, and millions in money." The life history of the fungus was worked out and a simple remedy was found—the spraying of the crop at appropriate periods with Bordeaux mixture—and now the blight is rarely heard of.

The "Smut" disease which has ravaged the wheat crop throughout recorded history was brought under control as soon as Kuhn, in 1858, showed that the fungus infection took place at the seedling stage, and that the smut spore adherent to the grain, but not the grain itself, was killed by a moderately dilute antiseptic. Now the wheatgrower secures complete immunity by pickling his seed with bluestone, formalin, or copper carbonate, at the cost of a few pence per acre.

Insect Pests in Plants—*Phylloxera*.

The dreaded phylloxera disease broke out in the Bordeaux district of France in 1863, and in less than twenty years the disease had spread so rapidly that the total damage done was £400,000,000—twice the indemnity paid by France in the Franco-Prussian war.

From France it spread through Europe, Africa, and finally to Australia. It broke out in Geelong in 1877, Bendigo and Rutherglen in 1898, and wiped out 30,000 acres of vines in Victoria, worth £2,500,000 to Victoria.

The French Government sent a scientific commission to America to study the pest in its native habitat. After prolonged investigation this Commission demonstrated that—

(1) While the phylloxera insect caused galls on the leaves of the indigenous American vines, it did not in any way affect the roots of the vines.

(2) The phylloxera did not attack the leaves and stems of the European vines, but completely destroyed the root system.

(3) Hence if the European vines—the fruit of which was so valuable for wine making and table purpose—were grafted on the roots of American species, the resultant plant would be immune from the attack of the phylloxera.

After much careful research work, involving years of trials of American root stocks, a species of Rupestris vine was selected as the best stock. The vineyards of France and Europe were reconstituted with these phylloxera-resistant stocks, and phylloxera is no longer a menace. The whole of the Rutherglen district has been replanted with phylloxera-resistant stocks, and experience has shown that the grafted vines are absolutely immune from attack and thrive and yield well in the phylloxerated soil.

Biological Control of Prickly-pear.

The spread of prickly-pear in Queensland affords the world's greatest example of the invasion of a plant pest or noxious weed, and a most interesting experiment on biological control of plant pests on a grand scale.

Prickly-pears were brought to Australia by the early colonists without their natural enemies, and remained exempt from injury by native insects. They therefore spread with amazing rapidity in their new environment. In 1925 the pear menace probably reached its climax when 60,000,000 acres of more or less fertile land in Queensland and New South Wales was infested with the pest.

There is no need to detail the efforts which Queensland has made in attempting to rid its land of this menace. Various methods of control have been tried—its eradication by mechanical means, by chemical agencies such as poisonous sprays, and by biological means—the use of insect and fungus enemies of the pear. The most hopeful is the method of biological control.

In 1919 the Governments of the Commonwealth, Queensland, and New South Wales agreed to co-operate in investigating the possibilities of applying methods of biological control. The Prickly-pear Board was established to undertake this work. The first step was to search the cactus world for all types of parasites and predators, import them, and acclimatise them, and test them against crops and other plants to prove that they would not be harmful to plants other than the Opuntias. After demonstrating the value of these pests as destroyers, the next step was to breed them on an enormous scale and distribute them.

A large number of promising pests have been introduced, acclimatised, and tested under great difficulties. Among these the caterpillar of a brown moth with the euphonious name of *Cactoblastis cactorum* has proved most successful and destructive. Its advent has justly given rise to great optimism. Over 2,000,000,000 eggs of this parasite have been liberated in the prickly-pear belt, and on present indications, it would appear probable that vast areas of prickly-pear land will be reclaimed by *Cactoblastis* and other insects. It is to be hoped that native parasites or disease epidemics will not impair the efficiency of these introduced predators.

The Prickly Pear Board and the Prickly Pear Land Commission, who are responsible for the scientific and administrative work, are to be congratulated on the progress that has been made, and if, as seems probable, complete control by these biological agencies is ultimately achieved, an area of land as large as England will have been reclaimed, and a scientific principle of the highest practical significance will have been demonstrated.

Intensive Sugar Production.

In Java science has been applied to intensive crop production with amazingly satisfactory results. The Dutch Government maintains a large Department of Agriculture with strong scientific branches, but in addition there are many private research institutions conducted for each of the more important estate crops, sugar, coffee, tea, rubber, and tobacco.

The sugar industry was the first in Java to seek scientific assistance, largely because of the appearance of the "Sereh" disease towards the end of the last century. The famous sugar experiment station, established by the sugar-growers

at Pasoeroan, in Eastern Java, affords a remarkable illustration of the manner in which a research institution can assist a staple industry. The sugar growers levy a rate of 4s. 9d. per acre on every acre under cultivation for the research work at Pasoeroan. This brings in an annual revenue of £120,000. The station has a large scientific staff of first-class men engaged on agronomic, chemical, botanical researches on all phases of sugar-cane production. Probably nowhere in the world is there such an example of primary producers supporting fundamental scientific research work on such a large and imposing scale as at Pasoeroan.

That the work of the station has been successful is shown (1) by the heavy levies willingly given for a quarter of a century—this shows that the growers have faith in the value of scientific research—(2) by the results achieved. Since the establishment of the research station in 1890, the area under sugar-cane has more than doubled and the yield per acre, notwithstanding the extension of sugar culture to much poorer land, has been increased from 70 to over 120 quintals per hectare—i.e., an increased yield per acre of 70 per cent. In other words, the total production of sugar has more than trebled in forty years. Forty years ago the whole area was planted with Black Cheribon, but this has been succeeded by improved varieties bred by the institute. The latest and greatest triumph is a prolific variety of high sugar quality and possessing great powers of resistance, known as 2878 POJ, which promises to displace all other cultivated varieties. The production of this variety is a genetical triumph, for it was produced by hybridising the cultivated cane with a wild species or glagah (*Saccharum spontaneum*), which contains a different number of chromosomes from the cultivated species.

REFRIGERATION.

The application of the principle of refrigeration to the carriage of perishable produce opened up a new era of progress for Australia. The first shipment from Australia was made in the "Strathleven," in February, 1880, with 34 tons of beef and mutton. Since then the development of refrigerated shipping has rapidly developed and now the average annual export of beef, mutton, lamb, dairy products, and fruit exceeds £15,000,000 sterling.

Much scientific work is being done at the Low Temperature Research Station at Cambridge to further improve the conditions under which the carriage of refrigerated meat and fruit is conducted. Australia has made a substantial contribution to the problem of carriage of apples by showing that the bitter pit of apples, which has been responsible for heavy annual losses, is caused by packing the fruit in an immature condition. Much work remains to be done to determine the best stage of maturity to harvest the various fruits, and to determine the most favourable conditions of temperature, humidity, and methods of ventilation of the fruit in the hold of the ship to eliminate disorders of the fruit due to transport. Eventually these problems attending the transport of fruit overseas will be solved, in which case a new era of prosperity will be ushered in for our fruit industries.

AGRICULTURAL MACHINERY.

The farmer has been greatly aided by the development of labour-saving machinery. A century ago it took a man 3½ hours to cut with sickle and thresh with flail a bushel of wheat. To-day the same work is done with a combined harvester in less than three minutes.

The modern harvester is the most efficient, labour-saving and economical machine yet developed for handling cereal crops, and its introduction has greatly increased the efficiency of labour at harvest. Australia is one of the few countries in which the climatic conditions permit this machine to be used with advantage, and it is largely owing to this fact that our wheat growers, although 11,000 miles from their market, can compete with the world in economic wheat production.

Babcock Butter Fat Test.

In 1890 Dr. Babcock, of the Wisconsin University, discovered a simple method of determining the butter fat content of milk. The principle of the method was that the casein of the milk was dissolved by concentrated sulphuric acid, and that the fat could be separated from the milk by centrifugal force. He devised a simple piece of apparatus which enabled the dairyman to find the butter fat content of milk in a few minutes. This simple discovery has meant much to the dairying industry. Not only has it enabled butter factories to use an exact method of payment for milk and cream, in accordance with the quality of the product, but it permitted a more careful control over factory processes than formerly, and resulted in an enormous saving of butter fat formerly lost in skim milk.

Moreover, the Babcock test provided the means whereby the dairyman could detect the unprofitable animals in his herd, and thus provided a scientific basis for herd testing. How much improvement was possible in this direction may be realised from the fact that whilst the average production of butter fat per cow in Australia is about 160 lb. per annum, Melba XV. of Darbalabra produced, in an official test, 1,614 lb. of butter fat from 3,252 gallons of milk—a tenfold increase over the average production for Australia.

LIMITATIONS OF AGRICULTURAL RESEARCH.

These are a few of many illustrations which might be given of the direct way in which scientific research has assisted primary production. But having stated a few outstanding cases, I must now hasten to give a word of caution. Scientific research applied to agriculture involves the patient and painstaking examination of agricultural problems, and its processes are necessarily slow. The non-scientific public is accustomed to view science as it might a volcano—prepared for the eruption of some new discovery from time to time, but accepting the effects of the eruption without realising the processes which led up to it during the previous period of quiescence. The period of preparation by research before science can offer to the world some new discovery may be long, but the scientific machine is always quietly running in the laboratory.

Moreover, agriculture differs from other industries in which a new discovery may be followed by a sudden transformation of the old. Agriculture is an age-old industry, slow-moving and conservative. The agriculturist deals with biological processes—with the production of plants and animals—and processes of production cannot be speeded up. As Sir Daniel Hall has said, "It still takes a wheat plant six or nine months to develop, and cows bring forth their calves neither more quickly nor more numerously than they did in the days of Abraham."

These limitations lie in the nature of the materials with which agriculture works, and though agriculture owes much to the application of science, we must not hope for revolutionary changes such as those witnessed in aviation and wireless. The life cycle of animals runs into years, and even in cropping a rotation of years must often be followed to get the full effects of any change of method. Hence the results of agricultural research are absorbed almost imperceptibly into agricultural practice unless the agricultural educational methods are well organised and thorough.

APPLICATION TO MAJOR PRIMARY INDUSTRIES.

A few illustrations have been given of the manner in which science and invention have assisted primary industries. We may now consider the manner in which scientific research may be applied in the development of our major primary industries. Broadly speaking, there are two ways by which primary production may be increased —firstly, by increasing the acreage under crop or carrying stock, i.e., by extending the margin of cultivation into drier areas; secondly, by increasing the efficiency of production within the areas at present in use by improving the output per acre and per animal.

In all States Governments have attempted to increase the agricultural output by bringing new lands under cultivation in areas of light and uncertain rainfall. This has involved heavy capital expenditure for roads, railways, water supply, and heavy loan expenditure for financing the settlers to establish themselves and to provide the expensive plant necessary for cultivation. It is doubtful whether much of this expenditure has been justified economically, taking into account the high capital costs involved in providing the necessary facilities and the low average returns secured.

The alternatve method of increasing production is by increasing the efficiency within the existing settled areas by increasing production per acre and per animal by the application of existing knowledge and the discovery of new facts which will enable further intensification of production to be brought about. The common task throughout the world is to wrest from reluctant Nature all that Nature can be made to yield. To increase the output from agriculture involves the intensification of production, and this can be done by *research* on the one hand and *education* on the other.

It is a matter of common observation that a wire fence often separates the grower of a 30-bushel wheat crop from the grower of a 10-bushel wheat crop. This difference in production is not due to difference in the productivity of the soil, but to differences in the skill and applied knowledge of individual farmers. In a recent survey of one of the richest dairying districts in Australia it was found that on almost identical soil some dairy farmers were securing 250 lb. of butter fat per cow, whilst their neighbours obtained less than 80 lb. per cow. Here again the differences in production were due not to fertility of the soil but to different skill of the farmers in the breeding, feeding, and management of the dairy cattle.

One of the great tasks of the Agricultural Departments of the State is to induce the many to do what the few are actually doing to-day. In other words, to induce the careless or indifferent growers to use the approved methods of cultivation which the majority of successful farmers now employ.

No matter from what angle the problem of agricultural education and research be viewed, it resolves itself ultimately into the problem of providing a sufficiency of agricultural specialists, investigators, and extension workers and using them in an organised scheme of research and education. This is the clear and unmistakable lesson to be learned from the efforts of other countries in their work of stimulating agricultural ddevelopment.

Trained research workers are needed for the investigation of the principles underlying the successful cultivation of crops and the feeding and management of live stock, and the principles underlying the control of diseases of crops and live stock. Trained and tactful extension workers are also required to get into close personal touch with those whose farms and animals are giving mediocre yields. This extension and educational work in agriculture is, and should be, carried out by the State Departments of Agriculture.

WHEAT, WOOL, AND DAIRYING.

The three great primary industries of the Commonwealth are wool, wheat, and dairying. A substantial increase in production could be brought about if the majority of cultivators could be induced to follow the methods practised by the most progressive farmers and pastoralists.

Wheat.

Take the wheat industry as an example. The wheat yield of South Australia for the period 1916-1926 was 12.44 bushels per acre, as compared with an average yield of 4.74 bushels per acre for the decade 1892-1901, notwithstanding the fact that the area under crop has been increased by over 50 per cent. by bringing under cultivation land in regions of light rainfall.

Similarly, in Victoria, the average yield for the same period has increased from 7.65 to 14.40 bushels per acre, an increase of 100 per cent. During the same period the area under cultivation in Victoria has been extended by the development of land in the drier mallee areas.

In the Wimmera district of Victoria the average yield during the same period has increased from 7.08 bushels per acre to 20.9 bushels per acre—i.e., it has been nearly trebled. Somewhat similar progress has been made in Western Australia and New South Wales.

In all Departments of Agriculture much research and extension work has been done in wheat. The main principles underlying successful cultivation of wheat have been worked out, but the standard practices suggested by this work are far from being carried out by the majority of the wheatgrowers.

The actual returns obtained by 12,738 wheatgrowers in South Australia for a normal season, 1926-27, averaged 12.87 bushels per acre. One thousand five hundred and thirteen farmers reaped less than 6 bushels per acre, less than half the average of the State, and 303 farmers reaped less than 3 bushels, or one-quarter of the average yield of the State.

On the other hand, 1,458 growers obtained an average of 24.6 bushels per acre, and 81 over 36 bushels per acre.

The efficiency of farming in the newer districts, as expressed by average yields, is naturally lower than those of older settled areas, but even in the latter areas of liberal rainfall and favourable soil the same range of efficiency was disclosed. In point of fact, as was shown recently,* the low average wheat yields are due mainly to neglect on the part of a large number of growers to follow well-established principles in cultivation—fallowing, thorough working of the fallows, liberal use of soluble phosphate, rotational cropping, choice of suitable varieties of wheat, and proper treatment of the seed.

It is safe to say that, so far as South Australia and Victoria are concerned, the average yields of wheat per acre might be increased at least by 50 per cent. if all wheatgrowers followed in entirety the standard practices which are suggested by the research and demonstration work carried out by these States. This is one of the important problems in agricultural education and extension.

* A. E. V. Richardson, "Increased Efficiency in Wheat Production," Jour. of Agric., South Aust. (33, 297-316).

Still further increases will follow from any advances that are made in the control of fungus pests—take-all, footrot, flag-smut, and rust in wheat—which cause such appalling losses each year; the further developments in breeding improved wheat varieties; or in the determination of the physiological and morphological factors on which drought resistance is based. These problems can be solved only by intensive research.

Pastoral Industries.

Passing now to the pastoral industries—sheep, cattle, dairying—it may be said that practically the entire stock population, consisting of 100,000,000 sheep and 14,000,000 cattle, are maintained on the pastures. The output from the pastoral and dairying industries could be enormously increased if this large stock population could be (1) kept free from disease, and (2) adequately nourished, especially during periods of nutritional stress.

Animal Diseases.

Disease exacts a heavy annual toll from the live stock industries. Blowfly, liver-fluke, footrot, braxy, caseous lymphadenitis, and other diseases in sheep cause in the aggregate losses amounting to millions sterling annually. Similarly, in cattle, heavy losses are caused by worm nodules, tick, buffalo fly, pleuro-pneumonia, contagious abortion, mammitis, and tuberculosis. Time will not permit a detailed consideration of these pests.

Some of these pests—e.g., blowfly and buffalo fly—are being attacked by the Entomological Division of the Council for Scientific and Industrial Research, and many parasites are being studied with a view of combating these pests by methods of biological control.

The magnificent gift of Mr. F. D. McMaster of £20,000 for the establishment of a laboratory at Sydney University will enable research work on some of these important diseases to be undertaken, but the field to be covered is so vast and the issue so great that ultimately laboratories will need to be established at other centres to cope with the problems of disease affecting the pastoral industries.

Excellent work on animal diseases has been done by the Veterinary Research Station at Glenfield, New South Wales, but even the combined resources of Glenfield and the McMaster Laboratory will be insufficient to cover the wide field of investigation in a reasonable time.

Grassland Improvement.

The pasture lands of Australia provide the food supply of almost the entire stock population. The welfare of the stock is therefore ultimately dependent on the amount and nutritive value of the grass. No country is so dependent as Australia upon its pastures, and probably no country presents greater difficulties in the way of increased production from grass lands on account of the vastness of the areas, the diversity of soil and climatic conditions, erratic rainfall, liability to drought, all of which influence economic pasture production.

As only about 1 per cent. of the area of Australia is under cultivation, either with crops or sown grasses, it follows that for many years, and in the semi-arid portions perhaps indefinitely, the exploitation of the natural pastures must be looked upon as the main source of raw material for the pastoral industries.

The rational utilisation of the grassland resources is dependent upon a knowledge of the relationship of the various types of grassland herbage to one another and to the climatic, edaphic, and biotic factors which control them.

The first step is to classify the grasslands of each climatic and soil region in Australia according to the species of plants contributing to the pasture association, and to establish unit areas based on similarity in composition. The next step is to determine the extent to which each major grassland association may be modified by fertilisers, introduction of new species, and various forms of pasture management. With knowledge of such a nature available the work of developing grasslands would rest on a sound basis.

It must be borne in mind that the pastures of Australia over wide areas have seriously deteriorated in value. Prior to settlement the herbage of Australia was in equilibrium with a light grazing marsupial fauna. The advent of the white man with his flocks of sheep and cattle, his droves of rabbits, and the numerous plant immigrants, some useful but many noxious, that followed closely on his trail, upset the age-old balance of vegetation. The balance was further disturbed by occasional overstocking, accentuated by drought.

Little wonder that many of the valuable and palatable indigenous species have disappeared, that noxious weeds from other lands have rapidly spread themselves, and that the pastures have deteriorated in carrying capacity. Moreover for several generations there has been a continual drain on the pastures to supply the mineral nutrients required for the bony framework of the animals sold off the farms to supply the cities with food and raiment. In many parts of Australia this depletion of the soil in mineral nutrients, and particularly in phosphates, has been reflected in the condition of the stock, and the so-called deficiency diseases, or malnutrition, as evidenced by bone-chewing, are the result.

I made a calculation some years ago for the rate of depletion of phosphates from pastoral properties in Victoria, and showed that the equivalent of 1,800,000 tons of superphosphate had been removed from the pastoral properties of Victoria in the form of slaughtered animals and animal products during the last sixty years. Many million tons of phosphates would be needed to bring back the phosphate content of the pastoral soils of Australia to what they were at the beginning of settlement.

Viewing the grasslands of Australia as a whole, comparatively little attention has been devoted in the past to those intensive methods of animal production which characterise the practice of older countries—namely, the use of seeded pastures, improvements by topdressing with phosphates and nitrogenous fertilisers, conservation of the surplus growth for use during periods of nutritional stress, and improved methods of pasture management. Nevertheless, the change from extensive to intensive methods of production is making considerable headway, especially in the southern grassland region.

We may consider briefly some of these avenues of improvement.

Sown Pastures.—Some 4,500,000 acres, mostly in the coastal and elevated areas of Australia, have been sown with grasses. This area is quite insignificant in comparison with the area of Australia, or even the area of sown grassland in England. There is room for an enormous expansion in the area under seeded pastures, which normally exceed in carrying capacity and nutritive value the indigenous pasture which it replaces.

The remarkable transformation of the coastal areas of New South Wales and Queensland by the introduction of the Brazilian pasture plant (*Paspalum dilatatum*), and the equally remarkable effects of the introduction of Subterranean clover in the better rainfall country of South Australia and Western Australia, are illustrations of the greatly increased carrying capacity following on the introduction of superior types of pasture plants for specific environments.

The New South Wales Department of Agriculture has done much valuable work in demonstrating how production in the better rainfall areas may be increased by replacing indigenous vegetation with seeded exotic pasture plants. One of the activities of the Division of Plant Industry of the Council for Scientific and Industrial Research is the organisation of a plant introduction service whereby improved fodder and pasture plants from other parts of the world will be introduced and thoroughly tested out in co-operation with the State Departments of Agriculture in various parts of Australia.

Top Dressing.—The top dressing of pastures with artificial fertilisers provides a means of greatly increasing the output of grass regions of liberal rainfall. In the light of numerous investigations in several of the States, it is safe to say that the carrying capacity of pasture lands in regions of heavy to moderate rainfall can be more than doubled by top dressing with soluble phosphates at a comparatively trifling cost. While there has been a gratifying development in the practice of top dressing in the southern grassland region during recent years, it may be said that there are enormous areas of grassland—many millions of acres—in the higher rainfall areas of Australia which have never yet received a dressing of artificial fertiliser.

The investigations have shown that the productivity of the pasture is greatly increased by the application of phosphates; the quality of the pasture is improved both in protein and minerals largely by the stimulation of leguminous plants in the sward; and that the health, vigour, and fertility of the grazing animals have been vastly improved. Investigational work, moreover, has shown that the chemical composition of a pasture is a reflex of the soil on which it is grown, and that soils deficient in phosphate produce phosphate-starved grass, which in turn produces in grazing animals the characteristic symptoms of malnutrition and the deficiency diseases so frequently met with in Australia.

Apart from the use of phosphates, there remains the very important problem of determining the rôle of nitrogenous fertilisers in intensifying production from grasslands, especially on the sown pastures in the regions of heavier rainfall.

Mineral Licks.

In areas of light rainfall where economic considerations do not permit the use of top dressing, phosphate deficiency in the pasture may be corrected by allowing stock free access to mineral licks. The supplementing of the pastures with mineral licks has been fairly common in certain districts of Australia, particularly in Queensland, New South Wales, and Western Victoria, but the practice of using licks needs to be placed on a sound basis by ascertaining the major mineral deficiencies in each grassland region and adjusting the composition of the lick to the ascertained deficiencies in the pasture, and to the special needs of the grazing animals. The requirements will vary in the different grassland areas, and probably reach a maximum just before the normal break in the season.

Pasture Management.

Much might be said, did time permit, regarding the recent work in Britain, Germany, and New Zealand on the intensive system of grassland production in regions of heavy rainfall.

Recent work at Cambridge has revealed the fact that dried young herbage from a pasture has a mineral and protein content approximating that of the best concentrated stock foods, and that if pastures can, by controlled grazing and pasture management, be kept in a young leafy condition, the production of milk can be greatly stimulated.

Intensive methods of pasture management are being applied with great success in New Zealand, and the output of dairy products from that Dominion have increased by leaps and bounds during recent years. In the aggregate, the area of rich land available for such methods of grassland production is greater than the area available in New Zealand.

The output from the dairying industry, which is mainly located in the heavier rainfall areas, could be tremendously increased, apart from herd testing and better methods of breeding, through the more extended development of seeded pastures, the wholesale use of artificial fertilisers, the more general adoption of improved methods of pasture management, and the utilisation of the wonderful flush of grass towards the climax of the growing season.

Supplementary Feeding During Periods of Nutritional Stress.

Mature herbage has been shown to be of much lower nutritive value than young herbage, which is particularly rich in proteins and minerals and low in indigestible fibre. Mature dry herbage rapidly deteriorates in the field because of the leaching of soluble nutrients by dews and rain, the spread of fungi, shedding of seed, and the loss of leaf by wind and the trampling of stock. The fibre content of such herbage becomes high in proportion to the protein and mineral content, and the nutritive value of the herbage very low.

The Division of Animal Nutrition of the Council of Scientific and Industrial Research has been engaged on work of fundamental importance to the wool industry. It has shown that a most important constituent of wool is the sulphur-bearing ammo-compound known as cystine. The Division has demonstrated that "wool break" is usually caused by nutritional distress brought about by a diet deficient in cystine, and that this break in the fibre may be obviated by supplementary feeding with cystine rich proteins.

Moreover, some very important results have been recently obtained at Meteor Downs, in Queensland, on the effect of cystine rich foodstuffs used as a supplement to the pastures. The supplement chosen was sterilised blood meal. Two groups of lambs, each consisting of 100, were grazed in equal sized paddocks. The lambs receiving a supplementary diet of blood meal at the rate of about ½ oz. per day produced an average of 20 oz. extra wool than the lambs receiving no blood meal. The cost of the supplementary feeding averaged less than 10d. per head.

The net result, therefore, at this particular station was that 20 oz. of wool per sheep were obtained for an expenditure of less than 10d.

The Division is now engaged in a search for rich cystine-bearing material to use as supplementary feeding for sheep.

THE COUNCIL FOR SCIENTIFIC AND INDUSTRIAL RESEARCH.

It is clear from what has already been stated that there is wide scope for scientific research into the problems which limit production from the primary industries. The Commonwealth Government established the Council for Scientific and

Industrial Research to initiate and carry out scientific researches for the promotion of the primary and secondary industries. As the primary industries were of such outstanding importance to the welfare of the States and the Commonwealth, the main efforts of the Council have been directed to the scientific problems associated with primary production.

From its inception the Council sought to co-operate and collaborate with State Departments of Agriculture and Universities in the development of this important field of research. It convened a representative conference of these bodies in 1927 to consider the relative spheres of the Council and State Institutions in regard to Agricultural Research. The conference decided that in view of the number and magnitude of the problems confronting the agricultural and live stock industries of Australia, Commonwealth participation in agricultural research was desirable, and indicated many fields of work in which research might be conducted on a national basis—e.g., animal diseases, animal nutrition, plant pathology, entomology, and soil research.

The Council for Scientific and Industrial Research appointed a standing Committee on Agriculture comprising the permanent heads of the State Agricultural Departments, to ensure complete co-operation and collaboration with State institutions in the development of agricultural research in Australia.

It was recognised that there need be no overlapping of effort of Commonwealth and State activities if the Commonwealth restricted its efforts to the major problems affecting great climatic regions rather than political boundaries—the more or less national and fundamental problems of nutrition and disease in crops and stock and on soil problems and forest products research—whilst the States continued their work on problems of special local importance and interest, and to the application of the knowledge gained to the improvement of practice.

Six divisions have been established to attack major sections of the work, each being under the control of an eminent authority. The Divisions already established are animal nutrition, animal health, plant industry, entomology, soil science, and forest products. The shortage of scientific personnel adequately trained in directions necessary for the investigation of Australian problems has been a serious factor militating against progress. The effect of the world-wide movement for the greater application of science to industry that has taken place since the war has resulted in an acute shortage of research workers trained in sciences broadly classed as biological. Nevertheless, the progress made by these Divisions has been very satisfactory, and the results of the work have been made available in the publication of the Council for Scientific and Industrial Research.

Co-operation has not only been sought with State Departments of Agriculture and the Universities, but a close link has been forged with British Research Institutions through the Imperial Bureaux and the Empire Marketing Board. A large appropriation has been made by the Empire Marketing Board towards the testing out by Australia on a large scale the possibilities of biological control of insect pests and noxious weeds. The results of this co-operative investigation will be of great significance not only to Australia, but to the whole Empire.

The advent of the Council for Scientific and Industrial Research into the field of agricultural and pastoral research should stimulate and assist the development of research in State Departments of Agriculture and Universities.

STATE DEPARTMENTS OF AGRICULTURE.

It would be difficult to assess the immense value of the research and extension work conducted by the Departments of Agriculture, and the effect of this work in developing the agricultural industries.

The marked advances that have been made in the wheat industry during the past decade is one striking illustration of the success which has attended their efforts in the direction of research and extension. These State Departments should be encouraged to develop their research work to the utmost extent, because it forms the only basis on which a rational system of extension and propaganda work in agriculture can be developed. In the enthusiasm to promote agriculture, a State may be tempted to encourage extension and propaganda work without providing a sound and adequate basis for such propaganda through research. Such efforts are bound to fail because experience elsewhere has shown that research and then demonstration must always precede propaganda. American agricultural institutions completely failed to influence the farming classes until a sound basis for teaching and extension had been accumulated through the work of the Agricultural Experiment Stations.

It is recognised elsewhere that the modern agricultural State must cultivate agricultural research and extension if it is to survive in world competition with its agricultural products. The clear lesson of experience in all great agricultural countries of the world is that a permanent increase in the output from the land can only be achieved by applying the results of research and the teachings of science to every branch of primary production. As production from the agricultural and pastoral industries becomes more intensive and diversified there will be an increasing demand for knowledge of the principles underlying agricultural and pastoral production, the methods of controlling crop and animal diseases, and this demand can be satisfied only by the further development of the facilities for research and extension work in agriculture.

CONCLUSION.

In other countries a strong national sentiment has been developed towards agriculture. The administrators of agricultural countries such as the United States, Canada, South Africa, Denmark, Japan, and Java, not only believe that agriculture is the basis of the country's wealth, but they translate this belief into action and legislation. These nations think in terms of agriculture. This attitude finds practical expression in the liberality with which agricultural research is supported and the readiness with which these countries map out policies for steady, continuous development over long periods.

Australia has the most varied conditions of agriculture of any single political unit in the Empire—a climatic range from tropical to temperate conditions, from highly humid to very arid conditions—with a corresponding variety in production. Moreover, it is a country of continental dimensions with a relatively sparse population enjoying a high standard of living. The full development of its agricultural resources can be realised by maintaining high efficiency in output of agricultural produce per man, by the use of labour-saving machinery, efficient methods of production, and applying all the resources of science to the cultivation of the land and the raising of livestock.

In view of the importance of the primary industries to national welfare, it is highly desirable that our resources should be conserved by the best methods known, that they should be developed to the highest degree attainable, and that the conception of an organised agriculture based on development through research and education should be part of the mental equipment of every statesman and administrator.

SURVEY OF QUEENSLAND SOILS.

The Secretary for Agriculture and Stock, Mr. H. F. Walker, M.L.A., announced recently that Mr. J. R. Taylor, M.Sc., Commonwealth Soil Survey Officer attached to the Council for Scientific and Industrial Research, had just completed a visit to Queensland which had extended since 5th May last. His visit was consequent on an invitation from Mr. Walker for the purpose of advising his Department upon matters connected with the future soil investigation of Queensland, with particular reference to a suggested soil survey of certain areas likely to be later available for development. In the first instance Mr. Taylor, accompanied by Dr. Kerr, Soil Technologist to the Bureau of Sugar Experiment Stations, Mr. G. B. Brooks, Senior Instructor in Agriculture, Mr. N. King, of the Agricultural Chemist's Branch, visited the Mackay district, where four days were spent on the Eungella lands, as well as all the cane areas within a radius of about 10 miles of Mackay. In the latter areas the various types of soil on which sugar-cane is growing were specially examined. Mr. Taylor next proceeded to the Dawson Valley, spending about a week there, mainly in the Theodore zone. On his return to Brisbane some days were spent at the Congress of the Australasian Association for the Advancement of Science, and Mr. Taylor's next journey was to the district between Roma and Toowoomba, with the special object of looking into the possibilities of the extension of wheatgrowing in the section to the west of Dalby, and south of the railway line between Dalby and Roma. Mr. Taylor has returned to his headquarters at the Waite Institute, Adelaide. He will later furnish a report to the Minister embodying his observations and suggestions for the carrying out of soil survey work in Queensland.

CLIMATOLOGICAL TABLE—MAY, 1930.

SUPPLIED BY THE COMMONWEALTH OF AUSTRALIA METEOROLOGICAL BUREAU, BRISBANE.

Districts and Stations.	Atmospheric Pressure. Mean at 9 a.m.	Shade Temperature. Means. Max.	Means. Min.	Extremes. Max.	Date.	Min.	Date.	Rainfall. Total.	Wet Days.
	In.	Deg.	Deg.	Deg.		Deg.		Points.	
Coastal.									
Cooktown	30·00	82	70	88	3	50	31	449	12
Herberton	..	72	58	80	8	52	22	223	14
Rockhampton	30·13	77	60	85	11	50	15	478	11
Brisbane	30·22	72	57	81	12	50	15	798	15
Darling Downs.									
Dalby	30·23	71	47	78	11	34	15	221	7
Stanthorpe	..	63	44	69	5,18	28	17	284	13
Toowoomba	..	63	47	73	16	35	15	550	13
Mid-interior.									
Georgetown	29·99	86	63	92	7,11	55	3,4,5,6	30	2
Longreach	30·11	78	54	86	11	44	15	302	4
Mitchell	30·20	70	46	81	11	33	18	174	6
Western.									
Burketown	30·02	86	63	94	11	59	16,20, 21,22	47	2
Boulia	30·09	80	51	89	6,7	39	15	17	1
Thargomindah	30·18	71	51	81	11	41	16	53	2

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF MAY, IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALL DURING MAY, 1930 AND 1929, FOR COMPARISON.

Divisions and Stations.	Average Rainfall. May.	No. of Years' Records.	Total Rainfall. May, 1930.	May, 1929.
North Coast.	In.		In.	In.
Atherton	1·89	29	3·77	1·29
Cairns	4·32	48	6·07	1·96
Cardwell	3·45	58	6·52	1·61
Cooktown	2·84	54	4·52	0·71
Herberton	1·57	43	2·48	0·81
Ingham	3·24	38	8·08	0·76
Innisfail	12·05	49	22·91	3·77
Mossman	3·32	17	6·49	2·36
Townsville	1·26	59	4·48	0
Central Coast.				
Ayr	1·05	43	3·00	0
Bowen	1·24	59	5·73	0
Charters Towers ..	0·73	48	3·75	0
Mackay	3·67	59	7·92	0·34
Proserpine	4·22	27	5·87	1·06
St. Lawrence	1·71	59	5·96	0
South Coast.				
Biggenden	1·70	31	2·34	0
Bundaberg	2·61	47	3·37	0·31
Brisbane	2·83	78	7·98	0·42
Caboolture	2·77	43	8·38	0·47
Childers	2·10	35	3·16	0·22
Crohamhurst ..	4·74	37	15·58	0·89
Esk	1·94	43	5·27	0·14
Gayndah	1·49	59	5·90	0
Gympie	2·85	60	4·42	0·12
Kilkivan	1·80	51	4·14	0
Maryborough	3·04	58	5·66	0·25

Divisions and Stations.	Average Rainfall. May.	No. of Years' Records.	Total Rainfall. May, 1930.	May, 1929.
South Coast—continued:	In.		In.	In.
Nambour	4·69	34	8·87	0·72
Nanango	1·47	48	3·47	0
Rockhampton ..	1·40	43	4·78	0
Woodford	2·82	43	9·04	0·44
Darling Downs.				
Dalby	1·29	60	2·21	0·12
Emu Vale	1·10	34	2·39	0·31
Jimbour	1·17	42	2·21	0·03
Miles	1·46	45	3·22	0
Stanthorpe	1·84	57	2·84	0·23
Toowoomba ..	2·14	58	5·50	0·05
Warwick	1·52	65	2·86	0·09
Maranoa.				
Roma	1·41	56	1·97	0
State Farms, &c.				
Bungeworgorai ..	0·75	16	2·00	0
Gatton College ..	1·55	31	3·25	0·07
Gindie	0·86	31	3·76	0
Hermitage	1·11	24	2·52	0·09
Kairi	1·68	16	4·50	0·50
Mackay Sugar Experiment Station ..	3·15	33	7·88	0·35
Warren	0·83	15	..	0

GEORGE G. BOND, Divisional Meteorologist.

STANTHORPE FRUIT INDUSTRY.

REPORT FOR THE 1929-1930 SEASON.

The Director of Fruit Culture, Mr. George Williams, has received the following report from Mr. H. St. John Pratt, Instructor in Fruit Culture:—

As anticipated, the Stanthorpe fruitgrowers have not had as prosperous a season this year as last when prices for all classes of fruit and vegetables were abnormally high, especially in Sydney, and Stanthorpe reaped the benefit. This year, prices although considerably lower than last year are still above the average, and the note of pessimism sounded in some quarters is due to the fact that certain growers have been inclined to take last season as normal whereas it was decidedly abnormal.

A Year of Abundance.

This season the growers of early stone fruit did exceptionally well up to Christmas, but after the New Year prices were disappointing for all classes of fruit and still more so for vegetables.

This season has been one of abundance and plenty for all classes of fruit and vegetables, not only in Queensland but also in New South Wales.

In Stanthorpe there has been a large crop of all varieties of fruit—apples, pears, peaches, plums, and grapes, as well as vegetables.

This seldom happens, usually if there is a heavy stone fruit crop, then the apples will be light, or if they be heavy then perhaps grapes will be light, but the season 1929-30 will be remembered as one when all classes of fruit cropped exceptionally heavily.

Of course the best condition from a Stanthorpe point of view arises from a dry season elsewhere with a moderate rainfall in Stanthorpe.

Prices.

Although prices, generally speaking, have been much lower than last year, yet many growers have done as well as last year; especially those who have established for themselves private markets. This avenue of disposing of produce is being exploited more every year with ever increasing satisfaction to both producer and consumer. There is also an increasing delivery of fruit and vegetables to the Northern Rivers of New South Wales per media of motor lorries.

The glut in fruit and vegetables and consequent low prices is to some extent due to the coal strike in New South Wales and the prevailing unemployment. Men out of work with no immediate prospect of obtaining it very often start a garden and not only grow their own requirements but also a surplus which they sell—in fact, they become market gardeners on a small scale.

Improved Cultural Practice.

Although there is still room for improvement, a better class of fruit is marketed each year from Stanthorpe—more thinning out was done for last season than the previous one, and the large crop just experienced has still more forcibly brought home to many growers the absolute necessity of only growing and marketing the very best of fruit and vegetables.

There is proceeding in Stanthorpe the gradual elimination of the worthless and poorer varieties of fruit. A large number of trees were reworked last season, and from inquiries at the office it is apparent that an even larger number will be reworked this year. Needless to say this elimination must be gradual as the average orchardist cannot afford to put too many trees out of commission, as it were, at once. This office serves quite a useful purpose in collecting and distributing scions of approved varieties from specially selected trees of the various varieties for this purpose.

Pest Control.

The chief outstanding feature of the year has been the remarkable absence of fruit fly. It is quite safe to say that there has been considerably less fruit fly this year than in any year for the last ten years.

The fly made its appearance all over the district last November as usual, but the orchardists were careful to immediately pick off and destroy all infected fruit, with the result that there has been this year a minimum of fly.

Of course other agencies may have been at work which prevented invasions of fly from other districts, but, generally speaking, the Stanthorpe orchardists have done their part as to fly control.

The same, however, cannot be said as to Codlin Moth. There has been far too much moth in the district this season, and the growers together with the officers of the Agricultural Department must view this problem very seriously. It is a pest

that can be controlled and, generally speaking, any grower who is more or less free from moth can take all the credit to himself, and, conversely, a grower who has suffered severely must at least take most of the blame.

A very large crop of grapes has been harvested, due to a great extent to the weather being so very favourable to grape production—a fact which accounted largely for the almost entire absence of disease. In fact the weather has been almost too good as the careful grower has not reaped the benefit that he usually does (and is justly entitled to) over the grower who is not so assiduous with his spraying and other field operations for the prevention of disease.

Oversea Export.

The export of fruit from the Summit district to the East has also been an outstanding feature of the past season. The Producers' Distributing Co-operative Society, which is the fruit section of the Coastal Farmers' Sydney, purchased 2,500 bushels of apples from the Summit district in late January and early February, and exported them to the Fresh Fruit Receivers Limited, Singapore, for whom they are the Australian agents. This fruit arrived in good condition, also a trial consignment of pears, peaches, English and Japanese plums, thereby successfully demonstrating that all these classes of fruit can be exported to the East provided that sufficient care is taken in the grading and packing together with due regard to picking at the right time.

The P.D.S. Co. is keenly interested in Stanthorpe stone fruits as well as apples on account of both their fine quality and earliness, and it is confidently expected that increased consignments will be exported to the East this coming season.

The greatest care and supervision must be taken with such orders because Stanthorpe is up against an established and strongly entrenched United States of America market, and one consignment of inferior fruit or fruit arriving in bad condition would probably spoil this market for many years to come. Also 200 cases of apples were exported to Colombo and 100 cases to Hamburg as a sample consignment to test out these markets.

Another outstanding activity of the year was the establishment of a community packing house by the Committee of Direction at the Summit.

The deciduous section of the Committee of Direction having a sum of money to its credit the question arose as to how a portion of it could be spent in the best interests of the section. As marketing of the fruit appeared to be the operation requiring the greatest help, and it was thought by the district that packing houses would improve the operation, the Committee of Direction was asked to build a packing house in what it considered the most favourable locality in the district for that purpose. Eventually the Summit was decided on as the site, and the successful packing of apples the objective. Unfortunately the shed was not completed and ready to receive fruit before 15th January, by which time most of the early apples had been harvested, and so the season for the packing house was considerably curtailed. However, in spite of this and the setbacks which always attend a new venture, more especially one where co-operation is essential, the packing house has justified the experiment being made. The growers supplying it have expressed their satisfaction with it and its management, and it is expected and hoped that other districts will be requesting the same assistance from the Committee of Direction, and eventually there will be a chain of packing houses throughout the district selling Granite Belt fruit under the one brand.

The Marketing of Immature Fruit.

The marketing of immature and undersized fruit still remains a problem. Growers who persist in the practice are not only doing no good themselves but are a serious menace to the more intelligent orchardist who takes a pride in the quality and get-up of his produce.

The Coming Season.

The planting of new trees promises to be heavy this season. Good orchards are not for sale and the prospects for the coming year and the future of the industry are, I consider, good. The more successful orchardists are extending their areas under trees.

Successful Queensland Exhibitor at Hobart.

A report on the district would not be complete without a brief reference to Mr. Douglas Gow, who exhibited the other day so successfully at the Fruit Exhibition held at Hobart in the "Colombic Cup" competition or Grand Championship of Australia. All the States except Western and South Australia were represented in

this championship, the entries being eight from Tasmania, two from Victoria, and one each from New South Wales and Stanthorpe. The class was for five varieties of apples, one case of each, and Mr. Gow came 3rd with 432½ points out of 500. The winners gained 439½ points and 436½ points was second. Thus it will be seen that Gow was only 7 points behind the winner, or just over 1 point per case behind. When it is realised that the Southern fruit was practically exhibited direct from the tree, whereas that from Stanthorpe had to be held in cool store for six weeks, and then put up with eight days transport by rail and boat, it must be conceded that there is not much wrong with the Stanthorpe fruit and that it can hold its own anywhere. Mr. Gow is congratulated on his success, and the best thanks of the community are accorded him for advertising this district so forcibly and attractively.

THE THIN-SHELLED QUEENSLAND NUT.

By GEORGE WILLIAMS, Director of Fruit Culture.

The Queensland Nut (Macadamia) indigenous to the south-east coast lands of this State and to the north-east part of New South Wales provides excellent opportunity for the establishment of a profitable industry—apathetically neglected up to the present in favour of exotic perishable products more or less subject to disease to which the Macadamia so far as is known is immune.

Several types of nuts are produced upon trees of varying habit from the small spherical hard-shelled specimens which were found in the scrub lands mainly from Brisbane north and as far as Bauple. The small tree by which these are produced is of compact growth with usually small, glossy green foliage upon which the spiney borders are almost or entirely absent, more particularly on the older trees. The small white inflorescence is supported on short pendicles and seldom followed by more than two nuts, usually one. In the large fruited varieties the flowers are generally shaded with pink and the pendicles admit of carrying up to two dozen nuts. (The specimen illustrated, of the thin-shelled type, carries nineteen, produced on a four-year-old tree, not grown under very favourable conditions). Messrs. J. W. Waldron, of Eungella, and S. M. Greer, of Upper Dungay, have given much attention to improvement by selection, resulting in very fine types being now available. The thin-shelled, which succumbs under the pressure of ordinary nut crackers, is of medium size. A much larger type which may be readily opened with a pocket knife has been named "ever-bearing" on account of its productivity. Though variations are noted in the foliage of seedling trees, particularly the thin shelled, the principal features of their products do not seem to vary. The trees are more vigorous and productive than the small hard type and attain much greater dimensions.

Though indigenous and hardy under favourable conditions the Macadamia is subject to injury by heavy frost and will not thrive in a soil in which drainage is deficient. Its natural habit being fertile scrub lands it naturally follows that cultivation should follow upon similar soils or those nearly akin to them. Many of our banana plantations, which are not reasonably adapted for the production of other crops and are comparatively valueless after the profitable term of the bananas has been reached, could be interplanted with Queensland nuts which as they develop would give a most satisfactory return for a minimum of expense. Interplanting between bananas could be considered in plantations where all cultivation is effected by hand tools. The young trees will thrive under partial shade and would be several years in advance of those planted after the bananas were defunct.

The distances allowed between plants could be carried somewhat to fit in with other operations, a range of 24 to 30 feet apart would cover most situations. The average age at which the young trees become reasonably productive is about eight years. This appears a long distance ahead, but when compared with several fruit crops which entail general cultivation and suppression of disease for a minimum of five years before being reasonably productive, the advantage is much in favour of the nut whose crops are matured with a minimum of attention and can be held for a favourable market if so desired. There can be no question regarding market prospects; the quantity of nuts imported will dispel any doubts, and it may also be mentioned that inquiries have been received from overseas for quotations for up to 20-ton lots. The yield from developed trees varies from 50 to 150 lb., the few trees from which the nuts are sold in Brisbane averaging a cash return of £4 to £5 per annum. Allowing that a reduction of 33⅓ to 50 per cent. resulted as an effect of heavy production (a position which is extremely unlikely), the net return from the expenditure of an equal amount on any of our fruit tree crops would not show the nut to disadvantage.

PLATE 2.—A CLUSTER OF QUEENSLAND NUTS, THIN-SHELLED VARIETY.

THE COTTON INDUSTRY.

The Minister for Agriculture and Stock (Hon. H. F. Walker) made the following announcement recently:—

FOLLOWING on my recent trip of inspection through the Burnett, Callide Valley, and Wowan-Dululu areas, I have been in consultation with the Cotton Specialist of the Department regarding the carrying out during the coming season of a comprehensive set of varietal trials which will test out the possibilities of all cottons now under investigation. It appears by the results which have been obtained this season from the test plots and varietal trials that some of the varieties which have been imported by the Department may give more satisfactory results during abnormal seasons than does the Durango cotton, which is the main variety being grown at present. This applies particularly to some of the districts where either heavy rainfall or droughty conditions may be experienced at critical times in the development of the plants.

Varietal Trials.

The failure of the Durango variety to give satisfactory results under abnormal conditions was stressed at several of the meetings at which I had the pleasure to meet the cotton-growers in the districts mentioned. I advised at the time that the matter would be gone into very carefully, and now wish to announce that during the coming season a large series of varietal tests will be carried out with grower co-operators in the different cotton-growing areas of the State. These tests will be designed so as to allow of the obtaining of the most accurate information concerning the value of the varieties to the different districts. I wish to stress at this point, however, that the experiences in all other cotton-growing countries indicate the desirability of growing as few varieties as it is possible to carry on with, and the absolute necessity of growing only one variety in a district. Where two or more varieties are grown within a section, not only does contamination of the varieties take place through admixture of the seed in the ginnery machinery, but also through cross-pollination in the field by various insects. We have already had one experience in Queensland with the results to be obtained by growing a variety of mixed origin, and it is hoped that all growers will realise the necessity of growing only the one variety in a distrct.

Imported Seed.

As promised to a deputation of the Queensland Cotton Board, consideration has also been given to the importation from the United States of America of seed of medium stapled varieties, and which are quicker maturing than is Durango. Following on a conference with the manager of the Cotton Board and the Cotton Specialist of the Department, it was decided to import a half-ton each of seed of two varieties which appear to have possibilities under Queensland conditions. In addition to these, 100-lb. lots of seed of eight other varieties are also being obtained. Every precaution will be taken to make this seed free from insect and fungoid diseases. The seeds will also be planted in isolated quarantine areas, so the danger of introduction of serious pests or diseases into the main cotton area will be reduced to a minimum.

The Department considers it inadvisable to import larger quantities of seed of each variety, not only on account of the danger of introduction of injurious pests and diseases, but also of the "new place effect" which varieties of cotton often exhibit when introduced into countries with different climatic and soil conditions. The experiences with several of the varieties which the Department has introduced have indicated that very misleading results may be obtained in the tests conducted during the first few seasons a variety is tried out. Experiences in other cotton-growing countries have also been along similar lines. It is believed, therefore, it is better to at least partially acclimatise a variety before conducting any large scale of tests.

Durango Results.

The growers may rest assured, however, that the Department is going to try and overcome the difficulties which appear to have arisen in connection with growing the Durango variety in some areas. I would point out, however, that in some districts this variety has given excellent results over a series of years, and during my recent trip growers assured me they were well satisfied with the returns they had obtained from it. It can be seen, therefore, that it may be necessary to carry out a large number of carefully conducted experiments over a series of years before any finality may be reached as to which variety or varieties are best suited to Queensland conditions. This will require the hearty co-operation of the growers in the many districts in assisting the departmental officials in carrying out these most important tests.

BANANA EXPERIMENT STATION, KIN KIN.

ACTING MANAGER'S REPORT.

The Director of Fruit Culture, Mr. George Williams, has received the subjoined report from Mr. H. Collard, Acting Manager of the Kin Kin Banana Experiment Station.

Plot No. 1.

Variety, Gros Michel; when planted, January, 1929; distance apart, 15 x 15; fertiliser applied, No. 5 (3 lb.), N. soda super, and muriate of potash; cost of fertiliser per stool, 7d.

Desuckering to produce in separate rows, 1-2 and 3 followers. Baiting with cut portion of pseudostem dusted with Paris green and flour 1-6, also with borax and flour 1-5. This method of control for beetle borer was undertaken immediately after my arrival in October, 1929, and continued up to January last.

Regarding the present condition of these plants, the majority of which are carrying bunches, the growth generally is poor, rather short in stature, and lacking in girth. The plants attain a height of 6 to 8 feet, then produce bunches carrying 8 to 11 hands of bananas, 6 to 7 inches in length, 7 inches being the average length. The suckers for subsequent fruiting are of a comparatively poor type, attributable to unfavourable conditions, notably imperfect drainage in places, excessive shale, and absence of soil in other parts combined with leaching of essential plant foods.

Leaf spot and premature leaf decay are particularly conspicuous throughout this plot.

Plot No. 2.

Variety, Sugar; when planted, February, 1929; distance apart, 15 x 15; fertilisers applied, No. 5 (3 lb.), super, and muriate of potash 1-1; cost of fertiliser per stool, 6d.

When regard is paid to cost of fertiliser per stool and the ingredients applied, the general appearance of both parent plants and followers does not come up to expectation. Bunches of from 5 to 8 hands are carrying fruit rather below the standard quality for this variety.

During November, 1929, Mauritius Beans were planted in double rows between alternate rows of stools, for the purpose of determining whether a detrimental or beneficial effect might be observed in so far as the general appearance of plants are concerned when growing a crop of legumes in close proximity over a lengthy period.

Evidence so far obtained tends to favour rather than discourage this procedure, for the vigour of both parent plants and suckers up to the present stage are by no means impaired but rather the contrary; furthermore, from an economical viewpoint, a considerable saving is effected in chipping, and considerably less damage caused to surface roots, whilst the soil between the rows maintains a more even moisture and helps to retain the surface soil brought down from the higher areas during erosion. Fertilisers were again applied during the past month in varying quantities per stool of incomplete and complete fertilisers.

Plot No. 3.

Variety, Cavendish; when planted, January, 1929; distance apart, 10 x 10; fertilisers applied, No. 5 (3 lb.), Nauru (2 lb.); cost of fertilisers per stool, 5½d.

This plot has been set apart for Leaf Spot experiments, and also for beetle borer control. The work in connection with the former has been carried out under instructions from Mr. J. H. Simmonds, Plant Pathologist.

The vacancies occurring by the removal of these plants have been at various times replaced by carefully selected suckers and butts, these being treated with coal tar and water boiled together for twenty minutes, strength 1-3.

The plants after immersion in this preparation were planted and three months later thirty-four plants upon examination gave the following results, twenty-one completely rotten with no indication of having been attacked by the borer.

One plant having two adult beetles (alive) and two plants each having one adult beetle (alive) on the corms, but in no instance was actual tunnelling observed. Tar treatment has proved fatal to the majority of suckers and butts set out in shaley gullies, but when planted in a reasonable depth of soil, although undoubtedly retarding growth, eventually assumes normal development apparently unimpaired by the treatment.

Leaf spot and premature leaf decay, particularly towards the northern and western extremities of this plot, is much in evidence, which condition is obviously accentuated—in the former case by excessive clay.

The plants throughout this plot show a marked variation both in regard to vigour and size of bunches, the latter varying from 7 to 9 hands with fruit from 5½ inches to 6½ inches long.

A definite black moistened apex apparently originating at the flower tip is frequently observed and affecting a fairly large proportion of bananas, the dark moistened area extending and encircling the skin of the fruit. This affected area exudes small gummy spherical particles. I intend bringing these particular bananas under the notice of Mr. Simmonds on his next visit to this station.

Plot No. 4.

Variety, Cavendish; when planted, January, 1929; distance apart, 10 x 10; fertiliser applied, N. soda (1 lb.), amm. sulph. (2 lb.), cost of fertiliser per stool, 5¾d.

This plot is situated on the eastern boundary and having better soil, lesser amount of shale, and good drainage. The plants possess a good girth of pseudo stem, but lacking in height; the followers are making very fair growth. Bunches vary from 8 to 10 hands of fair quality fruit. The effect of nitrogen in combination with more favourable soil conditions was very marked in both leaf development and colour during December and January.

Leaf spot although present is of lesser extent than observed in Plot 3.

Plot No. 5.

Variety, Lady Finger; when planted, January, 1929; distance apart, 15 x 15; fertiliser applied, No. 5 (3 lb.), N. soda (1 lb.), super. (1 lb.), muriate of potash (1 lb.); cost of fertiliser per stool, 6¾d.

These plants have made very fair growth, attaining a height of 10 feet before fruiting, the bunches are from fair to good both in size and quantity, suckers profusely and of a very fair type.

Plot No. 6.

Variety, Cavendish; when planted, January, 1929; distance apart, 10 x 10.

This area has received applications of fertilisers, details as to the various ingredients, quantities, and costs per stool are as follows:—

Rows.	Per Stools.
1 and 2—Unfertilised.	
3 and 4—Nitrate soda (3 lb.)	5¼d.
5—Control.	
6 and 7—Superphosphate (3 lb.)	2¼d.
8—Control.	
9 and 10—Nauru phosphate (3 lb.)	2¼d.
11—Control.	
12 and 13—Amm. sulph. (3 lb.)	6d.
14—Control.	
15 and 16—Muriate of potash (3 lb.)	4½d.
17—Control.	
18 and 19—Bonedust (3 lb.)	3d.
20—Control.	
21 and 22—Nauru V amm. sulph (3 lb.)	8¼d.
23—Control.	
24 and 25—Nitrate of soda and bonedust (3 lb.)	8¼d.
26—Control.	
27 and 28—Superphosphate and muriate potash (3 lb.)	6¾d.
29—Control.	
30 and 31—Muriate of potash and bonedust (3 lb.) 1-1	3¾d.
32—Control.	
33 and 34—Muriate of potash and bonedust (3 lb.) 1-4	4½d.

The rows set apart for fertilising run north and south following a very steep incline with the first six rows of plants occupying land falling towards a stony gully on the western side, whilst on the eastern side of the plot is also a shaley gully or watercourse running from the south-east towards north-north-east, passing almost through the centre of the plot.

Such comprehensive manurial tests as conducted on this site possessing as it does much irregular conditions and qualities of soil, unfavourable gradient and formation when percolation and erosion takes place, it is obvious that any attempt to obtain authenic or reliable information is utterly futile. This fact is further enhanced when particular attention is paid to the untreated rows, where frequently the general appearance of the plants and also the bunches and quality of the fruit

likewise the development and type of suckers produced are observed to be equal and occasionally superior to those growing in rows which have received manurial treatment.

Generally speaking, the plants growing on the eastern and western portion irrespective of treatment are regarded as very fair, whilst those in poorer land and shaley gullies are much inferior. Bunches vary from 7 to 9 hands with bananas from 5 to 7 inches in length. Dusting experiments with copper carbonates for control of leaf spot are in operation throughout this plot under instructions from Mr. J. H. Simmonds.

Plot No. 7.

Variety, Cavendish; when planted, January, 1929; distance apart, 10 x 10; fertilisers applied, untreated.

This plot although untreated will compare favourably with those on the western side of Plot 6, but, however, slightly inferior on the centre area and upper portion where the soil verges into ironbark land.

Plot No. 8.

Variety, cavendish; when planted, January, 1929; distance apart, 6 x 6; fertilisers applied, bonedust (2 lb.); cost of fertiliser per stool, 2d.

This plot is a network of plants, in several instances plants have produced a bunch of bananas when attaining a height of 4 to 5 feet. The plants generally have a comparatively short pseudo stem, although of fairly reasonable girth. The number of plants at present bearing bunches are few, the bananas in some instances compare favourably with those of 10 by 10 spacing, whilst in other instances the actual fruits have a more shrunken or pinched appearance.

Plot No. 9.

Variety, Cavendish, distance apart, 6 x 6; when planted January, 1929; fertilisers applied, untreated.

Comparable with Plot 8; no appreciable difference in quality of fruit and general appearance of plants apparent.

Plot No. 10.

Variety, Cavendish; when planted, January, 1929; distance apart, 9 x 9; fertiliser applied, bonedust (2 lb.); cost of fertiliser per stool, 2d.

A slight improvement is observed in growth of plant and girth of pseudo stem, but very few bunches are produced. Those, however, which are showing appear to be slightly better than those on Plot 9.

Plot No. 11.

Variety, Cavendish; when planted, January, 1929; distance apart, 12 x 12; fertiliser applied, bonedust (2 lb.); cost of fertiliser per stool, 2d.

Owing to a large number of plants failing to grow and replanting having to be undertaken the plants on this plot are not of uniform height. The original plants, however, show a marked improvement both in height and girth and leaf development. Up to the present only a few bunches have appeared, but these are of very fair quality and length.

Plot No. 12.

Variety, Cavendish; when planted, January, 1929; distance apart, 15 x 15; fertiliser applied, bonedust (2 lb.); cost of fertiliser per stool, 2d.

Leaf development, height, and girth of plant show marked improvement over 6 by 6 planting, and are regarded as equal in all respects to the better type of suckers and bunches of those growing on Plot 11, but it is observed that bunches are somewhat slow in development, carrying hands of from 7 to 10 with open fingers of bananas 6½ to 7 inches in length.

PURE MILK.

NECESSARY PRECAUTIONS ON THE FARM.

For pure milk, stated the Metropolitan Dairy Inspector at a recent New South Wales Agricultural Bureau conference, he believed there was every prospect of an increased consumption, but it was necessary to remember what the term involved.

There were times, said the speaker (as reported in Agricultural and Pastoral Notes, issued by the N.S.W. Dept. of Agriculture), when one was forced to the conclusion that the term "pure milk" was in danger of entirely losing its significance, a state of affairs brought about by its free and unrestricted use by every individual engaged in milk distribution. The term could be seen, in the city at any rate, on signboards, billheads, advertisements, and all sorts of milk vehicles, and by its common usage the public had become somewhat indifferent to the value of its meaning. Pure milk was the fresh, unadulterated, and uncontaminated lacteal product of the healthy cow, and it was or should be the ideal of those whose job it was to produce it and those whose duty it was to supervise it and handle it that it should reach the public true to label and not anything less.

A Common Source of Contamination.

Clean and healthy cattle were essential to a pure milk supply, and in this regard the farmer's attention might first be centred upon a very common source of contamination of milk—the soiled body of the cow. Contamination, sometimes of the worst form because it might be pathogenic, was quite possible and had come under notice as a result of the unclean external of the cow. A dairyman needed to be constantly on the alert and to practise every precautionary measure against this form of contamination. Local and climatic conditions naturally played a big part in body soiling; the dairyman's responsibility was always present, but the vagaries of the weather were the governing factors in his methods of combat and control. Dust during continued dry weather was of far-reaching importance, but none the less important was mud during the wet. The position of the udder lent itself to easy external contamination. A herd of cows with well-developed udders was the aim of every progressive dairyman, but the bigger the udder the greater the external surface to deal with. A good, big, well-packed udder was worth the extra trouble, however, and there was no denying the fact that cows were partial to grooming with a soft brush or cloth.

Body soiling occurred in different ways. Amongst the most common was that which occurred on the night camp. It was the practice on many dairies where early morning milking was the rule to keep the cows handy in a comparatively small paddock overnight so that a round-up might be dispensed with in the morning. In cases where hand feeding in the bails was resorted to the cows of their own volition were never far away, and in either case as a result of constant use the ground or the greater portion of it became denuded of grass, and as a result the cows carried in a fair measure of dust or mud, as the case might be. Again, cows that were well fed spent a considerable amount of time in a recumbent position, and might select about the worst place they could for their siesta. Soiling from these causes was thus comparatively easy, and when it was borne in mind that many organisms, some of them disease-bearing, had their habitation in the soil, the necessity for care was evident.

Some Worth-while Measures.

Lack of appreciation of this necessity might indeed prove serious. An excellent precautionary measure was the clipping of the cow's udders. The resultant short hair offered less opportunity for dust or dry particles of earth to adhere, and the udders were easier to clean. Wiping of the udder and contiguous underparts with a damp cloth prior to milking was a simple thing and should always be done. Should mud be adhering, such as might happen in wet weather, the udder must be washed, but must be sufficiently dried and not left sloppy.

Contamination also occurred during wet weather as a result of the drip off the cow's body. Ten minutes under a roof before milking began would give them a chance to drain off, but failing that a scrape down on the milking side minimised the trouble.

Contamination also might occur as a result of scouring, and in this respect the "longtail" was something to be avoided; tails should be sufficiently shortened up. Body soiling after calving, particularly if things did not go right, also often occurred. and the tails and hind parts demanded attention. Contamination from these two last-mentioned causes was very objectionable, and such milk might rapidly develop into a menace, particularly to those of tender years.

WANTED A BETTER CLASS DAIRY COW.

RESULTS of the work of the studmasters of Australia supply ample evidence that the real dairy cow, the cow that produces butter fat at the least cost and returns the greatest profit, is the production of intelligent breeding, feeding, and management. If a cow does not inherit the function of producing a large quantity of butter fat, no method of feeding and management, however expert, can materially increase the yield. Pedigrees of themselves have little influence on the yield of milk and butter that a cow gives, production capacity being an hereditary characteristic. The high-class dairy cow is born with a capacity of giving a large flow of rich milk over a normal lactation period.

Systematic Herd Testing.

The successful breeder becomes familiar with the points and general characteristics of the breed of his choice, and he learns that there is a wide range of variation in production capacity among animals of the one breed. He finds it necessary to study individual animals and by systematic testing determine the production of each cow in his herd. Such information is the basis of assessing production costs—the chief essential in placing this business on a sound financial foundation. The work of recording shows that some dairy farmers obtain as much from one cow in cash as from three other cows fed and cared for in a similar manner. Herd recording enables the dairyman to remove the present burden of a "boarder," whose production is below a profitable basis, and proves the economical advantage of providing suitable fodder, the value of breeding to high class dairy sires, and the real worth of the young stock from recorded dams.

The Choice of a Sire.

Herd recording assists in the choice of a sire which is an important part of a breeder's enterprise, for the success or otherwise of a stud breeder depends to a great extent on the skilful selection of a sire and careful mating. The influence of a sire in a stud or herd cannot be overestimated, for every stud or herd of note has gained its position through the use of high-class prepotent sires. The influence of a number of famous dairy sires is much in evidence to-day through the pre-eminence of studs headed by worthy successors to famous dairy sires of the past whose good influence, through generations of careful breeding, established the law of heredity. In the breeding of dairy cattle it is recognised that production qualities are perpetuated by the use of sires the progeny of dams whose achievements have placed them in a premier position as producers of butter fat.

The all important matter of selecting the sire taxes the skill and judgment of breeders of domestic live stock. Some stud breeders possessed of insight and keen judgment acquired as students of pedigree, conformation, and performance are able to select readily the right class of sire from which to breed. The best of judges may, however, select a sire that does not beget animals of merit. In selecting a sire careful consideration must be given to type and characteristics of the animals from which he sprung. When in search of a sire the experienced breeder is influenced by the quality of the herd that appeals to him and which has produced strong sire lines. In estimating a sire's influence in a herd, attention must be given to the production traits of the female lines in his pedigree, extending over a number of generations. The study of the blood lines of the sire combined with a knowledge of the lines of blood of the females to which he is to be bred, will enable a breeder to select a sire to ensure systematic line breeding which has proved so highly beneficial in establishing many first-class studs. It is through a sire bred on production lines that the desired characteristics are transmitted to his progeny, and herds noted for high production are established. Many of the most successful dairy sires were not up to show ring form, but they all came from good producing ancestry of pure blood lines. The sire that all studmasters and dairy farmers should place at the head of their herds is one possessing a combination of high breeding and production merit. The Pure Breeds Association have on hand an official register of sires possessing such qualifications.

SOME OFFICIAL TESTS.

The dairyman who knows the value of each individual cow in his herd is right on top of his job. Recent official testing results supplied by officers of the Dairy Branch reveal that the cows listed as follows have qualified for entry in the Advanced Register.

SOME OFFICIAL TESTS.

Name of Cow.	Tattoo No.	Period of Test.	Age.	Milk Yield.	Butter Fat Yield.	Sire.	Dam.	Owner.
					Jersey.			
		Days.		Lb.	Lb.			
Lindley's Hope 2nd ..	4	264	Senior, 2 year old	4613	232·296	Lindley's Billy Hughes ..	Lindley Hope	H. Bellert, Gurgeena
Lindley's Handsome 2nd	2	273	Senior, 2 year old	4551·25	225·806	Lindley's Billy Hughes ..	Lindley Handsome ..	H. Bellert, Gurgeena
Hamstead Beryl 2nd ...	1 and 7	273	Junior, 2 year old	5868·625	272·862	Trecarne Cardinal	Beryl 12th of Condamine ..	J. R. Roberts, Toowoomba
Hamstead Gold Spangle..	2 and 7	273	Junior, 2 year old	5307·5	243·781	Trecarne Cardinal	Golden Beauty of Condamine	J. R. Roberts, Toowoomba
Trinity Georgette.. ..	95	273	Mature ..	7732	390·845	Trinity Defiance	Trinity Coral	J. Sinnamon, Goodna
Trinity Orchid	180	273	Senior 2 year old	8196	398·674	Ginger Duke	Trinity Sunset	J. Sinnamon, Goodna
Trinity Lavender ..	186	273	Junior, 2 year old	7762	318·506	Ginger Duke	Brunette of Kardinia ..	J. Sinnamon, Goodna
Trinity Columbine ..	157	273	Junior, 2 year old	7551	433·703	Trinity Governor	Trinity Coral	J. Sinnamon, Goodna
Trinity Meteor	199	273	Junior, 2 year old	5697	302·562	Trinity Governor	Trinity Mystery	J Sinnamon, Goodna
Trinity Gentle Lady ..	119	273	Senior, 4 year old	8324·5	377·754	Lord Ettrey of Banyule ..	Trinity Jewel	J. Sinnamon, Goodna
Trinity Sultan's Lass ..	H.B. 2453	273	Mature ..	8632	426·786	Trinity Mark of Honour ..	Sultan 4th of Oaklands ..	J. Sinnamon, Goodna
Trinity Daffodil	56	273	Mature ..	8246·75	432·483	Ginger Duke	Beaulieu Netta (imp.) ..	J. Sinnamon, Goodna
Trinity Keepsake ..	195	273	Junior, 2 year old	6228	325·362	Ginger Duke	Trinity Sultane	J. Sinnamon, Goodna
Speck 2nd of Hazelhurst	33	273	Junior, 2 year old	6855·25	411·648	Hadleigh Golden Lad ..	Hazelhurst Milkmaid Speck	C. Austin, Boonah
Shamrock of Glenore ..	62	273	Senior, 2 year old	5089·3	257·281	Safety's Hero of Glenore ..	Shamrock Farm Buttercup	A. F. Birt, Gundiah
College Prism	16	273	Junior, 2 year old	4586·125	217·59	Burnside Defender ..	College Peate	Agric. College, Gatton
Lindley Lady Prim ..	5	365	Mature ..	11092·5	613·444	Bright Star's Prince ..	Miss Prim	A. H. Bulow, Mulgeldie
Lindley Bright Star ..	6	273	Mature ..	7838·75	408·543	Bright Star's Prince ..	Talgai Creamery	A. H. Bulow, Mulgeldie
Starbright of Hazeldean ..	4	273	Junior, 2 year old	4665·25	285·146	Lindley's Bright Lad ..	Lindley Bright Star ..	A. H. Bulow, Mulgeldie
Lindley Creamery ..	12	273	Mature ..	7237·5	384·632	Lindley Waimate	Creamery	A. H. Bulow, Mulgeldie
Belle of Hamilton ..	03	273	Mature ..	7257·25	370·483	Palatine King	Countess of Hamilton ..	H. J. Wilton, Raceview
Cherry May of Pine Hill..	7	273	Junior, 2 year old	4405·25	217·855	Fazelea Peer	Cherry May of Rosedale ..	A. F. Birt, Gundiah
Baby 3rd of Glenore ..	59	273	Senior, 2 year old	5376·3	257·812	Safety's Hero of Glenore ..	Baby of Glenore	A. F. Birt, Gundiah
Storm Queen of Peachester	55	273	Senior, 4 year old	6915·9	376·028	Glengarriffe Nobles Warrior	Maid of the Mist	A. Rough, Peachester
Pineview Buttercup ..	6	273	Senior, 3 year old	7913	481·563	Carnation Lad	Pineview Princess	J. Hunter and Sons, Borallon

SOME OFFICIAL TESTS—*continued.*

Name of Cow.	Tattoo No.	Period of Test.	Age.	Milk Yield.	Butter Fat Yield.	Sire.	Dam.	Owner.
Illawarra Milking Shorthorn.								
		Days.		Lb.	Lb.			
Lovely of Alfa Vale ..	21	273	Senior, 2 year old	8228·875	336·909	Greyleigh of Greyleigh ..	Nellie 4th of Sunnyview ..	W. H. Thompson, Nanango
Nellie 3rd of Sunnyview	43	273	Mature ..	11255·5	452·069	Diamond of Greyleigh ..	Nellie of Bangalow ..	W. H. Thompson, Nanango
Handsome 3rd of Aurora	25	273	Mature ..	10637·75	484·946	Florrie 2nd's Boy of Blacklands	Handsome 2nd of Hillcrest	D. Spoor and Sons, Mundubbera
Emma 11th of Springdale	269	273	Senior, 2 year old	8388·5	323·759	Emperor of Springdale ..	Emma 10th of Springdale..	D. Spoor and Sons, Mundubbera
Favourite of Normanby ..	17	273	Mature ..	10212	473·051	Envoy of Normanby ..	Fancy of Normanby ..	H. Dickfos, Coleyville
Amy of Greyleigh ..	26	273	Senior, 3 year old	9383·5	381·310	Brightlight of Darbalara ..	Amy 4th of Fairfield ..	F. E. Birt, Sexton
Cherry of Lynfield ..	161	273	Senior, 2 year old	8867·35	370·86	Royal Monarch of Blacklands	Damsel of Lynfield.. ..	F. E. Birt, Sexton
Hilda of Mount Blow ..	53	273	Senior, 2 year old	7283·625	270·835	Brilliant of Greyleigh ..	Joyce of Mount Blow ..	Mrs. J. Handley, Murphy's Creek
Violet of Beechwood ..	89	273	Mature ..	9109·8	353·18	Bonnie's Fairfield of Beechwood	Mermaid of Beechwood ..	F. W. Woolley, Moregatta
Pettie 3rd of Springdale..	01	210	Mature ..	9024	369·442	Fussy Knight 2nd ..	Petty 2nd	T. G. O'Meara, Humphrey
Sweetheart of Royston ..	1	273	Mature ..	11696	467·168	Artist of Wunulla	Pettie 3rd of Springdale ..	T. G. O'Meara, Humphrey
Princess 7th of Fairlie ..	137	273	Senior, 2 year old	7833	321·222	Dividend of Rosenthal ..	Princess 3rd of Fairlie ..	C. B. Mitchell, Warwick
Bella 12th of Kilbirnie ..	163	273	Junior, 3 year old	9609	391·861	..	..	Macfarlane Bros., Radford
Buttercup 6th of Burradale	117	273	Mature ..	9730·25	371·561	Kitchener of Burradale ..	Buttercup of Burradale ..	Agric. College, Gatton
Belle of Royston	09	273	Mature ..	9366	382·234	Sherry 2nd of White Park	Bud of Royston	T. G. O'Meara, Humphrey
Mayflower 5th of Rosenthal	317	273	Senior, 4 year old	8375	311·743	Hopeful of Rosenthal ..	Mayflower 3rd of Rosenthal	S. Mitchell, Warwick
Lassie 15th of The Cedars	31	273	Senior, 2 year old	6974·5	269·187	Red Knight of Greyleigh ..	Lassie 5th of The Cedars ..	J. L. Lydnon, Worongary
Polly 7th of Springdale ..	299	273	Junior, 2 year old	8846·25	341·532	Lovely's Commodore of Burradale	Polly 5th of Springdale ..	Hickey and Sons, Wilston
Duchess of Murray's Bridge	20	273	Junior, 2 year old	8286·5	305·041	Valiant of Greyleigh ..	Duchess 4th of Brooklyn Terrace	Hemming Bros., Warwick
Stately of Roselea ..	94	273	Senior, 2 year old	6962·25	275·329	Florrie's Victory of Blacklands	Nutley of Blacklands ..	J. F. Reinke, Mundubbera
Picture 6th of Raleigh ..	9	273	Junior, 4 year old	9804·673	405·526	Democrat of Raleigh ..	Picture 2nd of Raleigh ..	A. J. Caswell, Wangalpong
Rosie 4th of Greyleigh ..	152	273	Mature ..	12957·375	479·211	Joffre of Greyleigh ..	Rosie 3rd of Greyleigh ..	A. J. Caswell, Wangalpong
Friesian.								
Hermoine of St. Gwithian	6	273	Mature ..	13249·5	432·624	Pabst King Pontiac Lad ..	Miss Hook	Hickey and Sons, Wilston
Pontiac College Princess..	D.A. 1	273	Mature ..	13564·5	479·88	Pabst Pontiac Bene Star ..	College Prima Donna ..	Hickey and Sons, Wilston

SHEEP FARMING.

By J. L. HODGE, Instructor, Sheep and Wool.

THE Department of Agriculture and Stock is willing at all times to send an officer to give advice to the small selector on all matters appertaining to the improvement of the block, ring-barking, water, fencing, the erection of permanent improvements, and a lot of other points which, correctly given and faithfully followed, means a great saving in money to the selector, and possibly the difference between success and failure.

Make Haste Slowly.

Too many young men start operations full of enthusiasm, but lacking in judgment. Make haste slowly is sound advice. In the matter of fencing, which undertaken by an inexperienced man can run away with a lot of money without giving the return it should, the selector would be well advised to first of all complete the horse paddock, after picking the best possible position for it, having in mind the enclosure of water without interfering with the supply for the sheep paddocks outside.

Should the natural lay of the land enable one to place the horse paddock somewhere near the centre of the property, the selector is fortunate, for not only does the horse paddock fencing count as part of other subdivisions, but much time is also saved in the course of the year by having the homestead and horse paddock centrally situated. My reason for advising the selector to complete the horse paddock before undertaking any other work is based on years of experience. Too often horse hunting goes on for half a day, which could be so profitably spent otherwise.

If the selector is unmarried, the homestead can be considered later.

Attention should now be given to the boundary. More than likely there are only two sides to fence. This should be completed as soon as possible. Many a selector has had a lift in a financial way by being in a position to take stock on agistment.

Finance.

Having arrived at this point in the development of the holding, the selector should take careful stock of his financial resources. With a horse paddock and boundary completed, one is now in a position to carry some stock. It should now be the object of the owner to make the selection pay for further improvements. Advice with regard to stocking depends to a great extent upon the financial resources of the individual, but for the purposes of this paper we will take it that the selector has his way to make and a rough row to hoe. As before mentioned agistment sheep may be secured. In this case conserve finances with the object at the end of the agistment of being in a position to purchase a small line of sheep. In this connection it is as well to mention here that the Agricultural Bank will advance up to £1,200 for this purpose at 5 per cent. interest to approved applicants, and very liberal terms in the matter of repayments.

Although against a mortgage on general grounds the writer is of the opinion that the selector should at this period of his career on the land make use of the facilities offered.

Stocking.

Then comes the all-important question—"What sheep to purchase?"

If the country is heavily timbered, probably no ring-barking has yet been done, and the land in its virgin state may not be first class. Under these circumstances, I would advise the purchase of a line (to suit the purse) of fattening wethers, the object again being to make the sheep pay for further improvements. Shear these once, and endeavour to fatten with about a four to six months wool.

Where the land selected is improved sheep country I suggest the purchase of a line of ewes for a start, say four to six years old, as the price asked is likely to suit the ability of the selector to pay. In this case make every endeavour to keep the ewe lambs as the basis of a future flock. The greatest care should be taken in purchasing a type of sheep suited to the country and other local conditions. Herein may possibly be the difference between success and failure. If inexperienced, let the selector seek the advice of some old hand in the district, or the services of an officer of the Department of Agriculture and Stock.

Great importance attaches to the sheep to be purchased and, in the case of ewes, the selection of the right type of ram to mate with them.

Let it always be remembered that, apart from the sheep an owner would like to breed, he must, to achieve the greatest success, go for a type to suit his country, rainfall, and local conditions generally.

Quality is important, but the breeder should never lose sight of the fact that constitution is of the major importance. In districts like the west of Queensland, where periodical droughts may be looked for, it is of the utmost importance that the type of sheep bred should be able to stand up to hardships, travel to water, and generally forage for itself. The selector's object should always be to have good sheep. It costs just as much to feed a bad sheep as a good one, and one good sheep, properly nourished and looked after will return as much as two ill-bred and badly nourished animals.

I would always recommend the selector to go after the strong, medium big-framed bold type of merino somewhere about a 60's quality. Having found a type suitable to the country stick to same. A great deal of harm is done to flocks by constantly chopping and changing in the matter of rams. Breed only, of course, from purebred stock, and the longer the pedigree of the animals and the foundation of the stud from which they come the better.

The rams should be slightly stronger in quality than the ewes or the progeny expected. Wool bred in the West has a tendency to fine up with the age of the sheep, and this should be remembered when founding a flock. Having established a flock it should be the aim of the selector to keep them good, and this, apart from general maangement, can be best done by judicious culling.

Before mating the ewes with the rams, go through the former carefully, and reject anything of the type not required, and reject also for any other reason such as malformation, size, want of constitution, &c.

Management.

Management will be learned by careful observation of the methods of neighbours long and successfully established in the district.

Change the sheep frequently from pasture to pasture. Even if, sometimes, a paddock appears to have less feed, the flock will improve.

Watch the condition of the flock keenly, and if a falling off in condition is observed find out the cause quickly.

In these days stomach worms should be watched for. The humped back, white skin, and sickly white in the eye when examined, an inclination to lag behind the rest of the flock, are all symptoms of this disease. Immediate steps should be taken to combat the infestation, and in this connection I would urge the grazier to get in touch with the Department of Agriculture and Stock. The best known drenches and their means of preparation and application to the sheep will be furnished.

Blowfly trouble should be early observed if there, and the treatment at once applied. In the case of these and other diseases or parasites, the Department is always willing to help, and full use should be made of the advice offered.

The Homestead.

If finances permit, consideration may now be given to the homestead. If the property merits the expenditure and if funds permit it is always well to erect a decent house. Apart from the living comforts, a decent homestead always has value in the eyes of a purchaser.

Woolshed and Yards.

Yards and woolsheds are a necessity, and these, too, should be up to the mark. In fact, with all improvements, it will be found economical in the end to make them as good as the property merits. Avoid over-improving. It must be remembered that the money outlay on improvements costs interest, and all should be of such a nature as to earn that interest and merit their existence.

Sheep Shearing.

For the first shearing it would pay the new man on the land to arrange with a neighbour. After getting the clip, combined with the proceeds of the sale of the wethers in the one case or the clip and the sale of the wether portion of the drop in the other case, the selector should be sufficiently strong financially to go on with other essential improvements.

Further Improvements.

Ring-barking where necessary is an economic necessity and should not be neglected. Some subdivision could now be gone on with, and here the greatest care should be exercised in making every panel of fence worth the money expended on it.

Water should have a guiding influence in the matter of sub-division fences.

It should, where possible, be the object of the selector to see that there is water in every paddock. If the country lends itself to the idea, subdivisions may run off the corners of the horse paddock, thus utilising the horse paddock fence in a double capacity. Gates, and good ones, should be erected at suitable places in the fences. It is advisable to make the gates good ones straight away. Too many beginners and others erect temporary (?) gates which stay for years and, apart from being an eyesore, are always a source of annoyance any time sheep have to be shifted.

SHEEP LICKS AND THEIR USES.

By J. L. HODGE, Instructor in Sheep and Wool.

The scientific need of a sheep lick should be determined by proved deficiencies in the soils, pastures, and the water to which sheep have access. This may be determined by analyses of all three.

The greatest proved deficiency in most Australian pastures is lack of phosphates. Therefore the basis of most licks should contain principally a material to make this good. The days when salt only was recommended in season and out of season are passed, and science has stepped in to indicate what ingredients should be supplied.

It does not follow that because a certain lick has proved beneficial to the flock in one district it is going to act in the same manner somewhere else. The main point to keep in view is the condition of the flock. Carefully note any falling off in condition, not attributable to seasonable conditions, and quickly find out the cause. In nearly all cases it will be found that there is some deficiency. This should be supplied with the lick.

When sheep are drinking from an artificial water supply such as bores and wells, analysis will show the amount of salt contained in the water. In prescribing a lick in the case where the water is proved sufficiently saline possibly no salt at all would be mentioned. On the other hand analysis may prove the entire absence of salt. Here the addition of the required amount may form the chief ingredient in the lick. Under drought conditions it is often beneficial to add a protein, such as linseed meal, to the lick.

Taken on broad lines and under adverse conditions, when a lick can be relied upon to do most good the ingredients should consist of phosphates, a protein, a laxative, and a tonic, with the addition of salt, the amount to be governed by the special conditions at the time obtaining.

The practice of feeding a lick to sheep in open troughs is not to be encouraged. Besides the risk of loss by rain, the flocks foul the mixture, making it eventually unfit for consumption.

A Lick Feeder.

The lick feeder recommended by the Department consists of a V-shaped trough with a hinged and covered top. There is an aperture at the bottom of the "V" which automatically releases the lick. A lick board sufficiently broad is attached to the stand about an inch and a-half below the opening and at a serviceable height from the ground. A beaded edge is supplied to save unnecessary waste.

Legislation these days makes it compulsory for the vendors to register their licks with the Department of Agriculture and Stock and to attach a label to each package setting out the contents. Many good proprietary licks are on offer, and the flockmaster proposing to purchase would be well advised to get the opinion of this Department.

During a good season the necessity for a lick decreases, and this is accounted for by the fact that the pastures themselves are supplying the sheep grazed on them with the necessary phosphates and food materials which are usually supplied in a lick when the season is adverse.

Beware of Over-Feeding on Salt.

Beware of over-feeding on salt in the case of ewes in lamb. I think it a good plan to take away most of the salt from a flock of ewes in lamb when half the period of gestation has passed.

The lick as prescribed and containing the salt may be fed to the dry portion of the flock with advantage should the salt be required, but the ewes in the case

stated should be deprived of the salt. The other ingredients may be given to advantage.

It should be the object of the flockowner to have his sheep consume from 2 to 3 oz. of a prescribed suitable lick per week. Ewes rearing lambs require more than dry sheep. Weaners and young sheep, too, could do with more than the dry portion of the flocks.

Rule-of-thumb Methods Out of Date.

It is not sufficient that sheep should be placed on grass irrespective of what that grass contains. It may be a case of starvation or malnutrition in the midst of plenty. It is what those grasses contain in the way of tissue, bone, and body builders which is so important.

The days are fast passing where rule-of-thumb methods may apply to the care and husbandry of sheep. Flocks lose condition, apart from drought, which is unavoidable, and too often the fact is either not noted or casually commented upon. There is a cause for this loss of condition, and it should be the care of every careful flockmaster to ascertain this cause. It will always be found that there is some deficiency, probably of those minerals which are so necessary for the maintenance of the health of the flocks. This deficiency should be detected and the ingredients required made available in the lick.

THE CARE OF THE CAR.

Every motorist will agree that the steering is the most important part of the motor car. A car travelling at 30 miles an hour covers approximately 15 yards a second, and it is very important, therefore, to know that the car is going just where the driver wishes it to. Peculiarly enough, the steering gear is a portion of the car that is most consistently neglected by the owner. Not only is it of vital importance to the safety of the car, but it has a remarkable bearing upon the comfort of driving. Many motorists wonder why an all-day drive is exhausting. However, when the number of steering operations made in a long drive is considered, the reason for physical exhaustion is obvious. There is among motorists much controversy as to what is the most satisfactory type of steering. Some prefer a large movement of the wheel, combined with lightness, whereas others prefer a small movement, even though the wheel be a little heavy to move.

The introduction of balloon tyres has increased greatly the difficulties of steering. The old high-pressure tyre made contact with the road on a very small area of the front wheel. However, the balloon tyre has a large flat area of rubber in contact with the road, and because of its good grip the road wheel is hard to twist, particularly when it is moving slowly.

Due to the introduction of balloon tyres there has been a tendency to reduce the turning circle of the car in the diameter of the minimum circle in which the car can turn. The balloon tyres caused an increase in the turning circle because designers found difficulty in making room for the bigger tyres, when the front wheels were twisted to their maximum deviation from straight ahead. A small turning circle is a great convenience when handling a large car on a narrow winding road. It is also of great use when attempting to park a car in congested streets.

The position of the steering wheel has a great bearing upon the comfort of the driver. The most comfortable wheel is one on which the driver naturally rests his hands. A wheel that is too far forward tires the driver, because he must always have his hands stretched out before him; on the other hand, a wheel that cramps the driver in his seat is insufferable.

The adjustable steering wheel makes for most comfort in driving, as the driver can move the wheel to suit his own requirements.

There are two obvious ways of reducing the effort required to operate the steering wheel. The first is to increase the leverage of the steering wheel over the road wheels and the other is to reduce the friction in the steering gear.

Although increasing the leverage reduces the force required to turn the wheel it carries with it the disadvantage that the steering wheel must be turned through a greater angle for any given movement of the road wheels. In the old days the usual thing was to have the steeding arranged so that one and a-half turns of the steering wheel would turn the front wheels from one lock to the other. Many modern steering wheels require two and a-half turns to do this. This increase in movement is a mixed blessing, as on occasions it is necessary to turn sharply when

only one hand is available for the wheel, and if the driver is not holding the wheel in a convenient position, he is liable to have to take a fresh grip before the turn is completed.

Reversible and irreversible steering are two terms often seen in motor car specifications, that are not always understood. The steering is said to be reversible when movement of the steering wheel will move the road wheels, and any tendency of the road wheels to deviate from the direction set will move the steering wheel. That is, the steering system works both ways. The steering is said to be irreversible when movement of the steering wheel will move the road wheels, but attempted movement of the road wheels will not move the steering wheel—that is, the steering system locks when an effort is made to work it in the reverse direction. An absolutely reversible steering gear would transmit all the sideways bumps received by the road wheels to the driver's hands, and so would make it necessary for the driver to hold the wheel very tightly if it were not to be jerked out of his hands. An absolutely irreversible steering gear, on the other hand, would transmit no road shocks at all through the steering wheel, but would also have no tendency whatever to be self-centring.

The tendency of the steering wheel to straighten up after a corner has been turned is known as self-centring. Some cars can be driven around a corner and then when the straight road is reached the wheel may be released, when it will "pay off" automatically until the car is moving straight ahead again. Such a steering system is truly self-centring, and many cars are fitted with such a steering system. However, in all cars the steering wheel can be returned to centre with much less effort than it takes to deviate the wheel from centre, so that all steering gears are partially self-centring. However, the more a steering tends to be irreversible the less will be the tendency towards self-centring. The designer must make the best possible compromise so that the driver receives only a little of the road shocks through the steering gear and at the same time does not have to exert any appreciable effort to straighten up after a corner has been turned. Some of the more expensive English car makers fit special hydraulic shock absorbers to prevent road shocks from being transmitted back to the driver.

One cause of very heavy steering is friction in the steering box and steering joints. Many motorists neglect the steering gear entirely when lubricating the car. This is probably due to the fact that the steering joints are usually inaccessible and seldom cause squeaks that will draw attention to their want of oil or grease. However, proper lubrication will prevent the steering from becoming unduly stiff and will also prevent excessive wear.

In almost all cars there is a ball joint at the end of the drag link. This ball joint in particular requires plenty of grease, if it is not to be worn quickly. The king pins should also be kept well greased, as the king pins carry a very heavy load which tends to squeeze the grease out very quickly.

The steering box invariably contains a piece of mechanism requiring plenty of lubrication, so that the careful driver should always see that this part is packed with grease or heavy oil. The various mechanisms contained in the steering box for converting the rotary motion of the steering column to the longitudinal motion of the drag link are very ingenious and will be discussed in another article.

In the interests of safety the steering gear should be checked frequently to see that all nuts are tight and all split pins in place. It should not be necessary to say that the steering wheel should never be turned while the car is at rest, for if this be done the steering gear will be strained unduly and possibly damaged.—Radiator in the "Farmer and Settler."

Readers are reminded that a cross in the prescribed square on the first page of this "Journal" is an indication that their Subscription —one shilling—for the current year is now due. The "Journal" is free to farmers and the shilling is merely to cover the cost of postage for twelve months. If your copy is marked with a cross please renew your registration now. Fill in the order form on another page of this issue and mail it immediately, with postage stamps or postal note for one shilling, to the Under Secretary, Department of Agriculture and Stock, Brisbane.

ERADICATION OF DISEASE AMONG PIGS.

By J. A. RUDD, L.V.Sc., Department of Agriculture and Stock, Brisbane.

The eradication of tuberculosis and other diseases in pigs is not difficult if certain very definite lines are followed to that end. The question arises: How does the pig become infected? It is undoubtedly manifest that there are several channels through which infection may be carried to the pig.

(1) Through transmission from parent to offspring.
(2) From milk and other dairy slops.
(3) The use of insanitary feeding troughs and general unclean condition of sties, and faulty methods of construction of sties so that it is a matter of impossibility to keep them clean and wholesome.

Hereditary Transmission.

Transmission from parent to offspring although possible is not a very constant source of infection, and may be dismissed with the observation that all things being equal there is in reality very little chance of infection from this source.

The Bucket.

Milk and other dairy slops are one of the chief sources of infection. Dairy cows all the world over suffer from tuberculosis. At least 2 per cent. of the cows of most herds are liable to spread infection through their milk supply, i.e., they have or are affected with tuberculosis of the udder, and unless this 2 per cent. at least are eliminated the chances of infection are very great. The elimination of this 2 per cent. is not a difficult matter, and it only requires the exercise of a certain amount of intelligence in order to do this successfully. Assuming that this 2 per cent. cannot for various reasons be cut out of the active list of the herd, the other method is to cook the skim milk before feeding it to the pigs. Raising a temperature of 155 deg. Fahr. for fifteen minutes will do all that is required, and not only the pigs but also calves will have the added advantage of being fed on milk which is not only very wholesome but absolutely free from disease. This is not a big undertaking and should be carried out purely as a routine practice, as it eliminates the germs of contagious mastitis, tuberculosis, and contagious abortion in one hit, and also a great many of the so-called diseases of young calves which are largely due to unclean methods of milking and treatment of milk after separation of the cream from the skim milk. The return as a result of immunity from disease will more than repay the added cost of the additional work necessary in order to insure immunity among the small immature stock on the farm.

Filth.

The use of insanitary feeding troughs and general unclean condition of sties and faulty methods of construction of sties make it a matter of impossibility to keep them clean and wholesome.

It is possible to obtain a culture of bovine tuberculosis and other bacilli from the cracks in the end of wooden feeding troughs. If these cracks or crevices are capable of holding such filth it is clearly an impossibility to breed healthy pigs.

If wooden troughs are an absolute necessity, then why not fill up the cracks and crevices with cement and clean them once every week with a strong solution of washing soda? There are certain woods which do not split and crack easily, such, for instance, as the mahogany which, although it will not stand in the ground, is used largely for piles in rivers where borers are prevalent. The erection of suitable pens with impervious concrete floors are an absolute necessity if disease is to be held in check.

The insanitary condition of pig pens. From their construction one is led to think that sanitation was not considered necessary and did not enter into the calculation of those who are responsible for such death traps. Slabbed floors raised off the ground through which excreta and products of decomposing vegetable and animal matter percolates on to the ground below and accumulating there for years is a common spectacle on most pig farms. The pig is securely enclosed in this sty, meticulous care being taken to make sure that all avenues of likely escape from such evil looking and filthy surroundings are completely cut off, with the result that he has to live his normal life surrounded on all sides by a cesspool of iniquitous fermenting filth, the gases from which escaping continuously not only make life a perfect nightmare but must of necessity breed disease, the result of which is only discovered when the returns from the factory disclose the fact. This specious form of cruelty should be discontinued if healthy pigs are to be bred, both for pleasure and for profit.

The Normal Pig.

Given healthy surroundings the pig is normally a hardy, thrifty animal and one that can be depended on easily to make the greatest profit out of the poorest food in comparison with other farm animals.

Breeding from healthy stock which are not inbred does help not only in early maturity but in keeping down disease. The pig is one of the few animals that will not stand inbreeding and whose constitution quickly resents any tricks in this direction. Breeding from immature stock, and this also includes promiscuous breeding, is a factor which cannot be too lightly regarded if success is to be assured in the breeding of pigs for profit.

Selection in Breeding.

The selection of breeding stock is not always attended to with the care that is necessary to guard against predisposition to disease. Knocked-kneed, swampy backed, boars and sows of similar conformation with the additional defect that they are down on their pins (i.e., weak fetlocks) are commonly seen among the breeding stock, with the result that these animals can easily be responsible for a great many of the ills attendant on immature young stock. "Like begets like" is one of the fundamental principles of breeding. This is a golden rule and is generally well known, but it is more often accepted and carried out in the breach than in the observance. So much depends also on the feeding of the parents not only after the pigs are born and still sucking their mother but before there is even a thought of breeding from her. The feeding of the boar is likewise as important, and neglect in this regard is responsible for so many failures—80 per cent. of the partial paralysis of pigs is bred into them by unsuitable mating of faulty parents and with such faults as are easily seen and could be quickly corrected by sterilisation of the unfit. If this was a difficult matter it might easily be overlooked, but as it is one of the everyday operations on the farm lack of care may easily account for a good deal of latent trouble, which manifests itself as time goes on, and the price paid for such neglect is altogether out of all proportion and makes all the difference between profit and loss. There is still another matter which is suggested for serious consideration, and that is the methods which may be adopted with the object of ridding the herd of the 2 per cent. cows which are in most herds and are infected with tuberculosis of the udder.

Getting Rid of the Two Per Centers.

Vaccination of all cows which have mammitis and the elimination of such cows which will not respond to treatment with vaccine, i.e., such cows as will not respond to treatment with vaccine even in as large doses as 20 cc. per day (the treatment starting with 5 cc. of vaccine as first dose) and at seven days' interval. If cows have tuberculosis of the udder there is no response, and if the cow survives the vaccine and if she is badly infected with tuberculosis of the udder she may die under such treatment. If she survives such treatment and still persists with active mastitis she is only fit for the local butcher if she is healthy in other parts of her body, but this is not likely. Therefore the first loss is the best, and she should be shot and burned or buried deeply in some dry soil on the border of the cultivation paddocks. All cows suffering from mastitis should be isolated and the milk buried until such time as the vaccine treatment is carried out, and this could be done by the owner with the assistance, in an advisory capacity, of the Dairy Inspector of the district.

This is suggested as a very good and practical method of ridding herds of the more saturated cases of tubercular disease.

BALANCED RATIONS FOR PIGS.

[*See Plate 3.*]

The six pigs shown in the illustration were litter mates and were "topped up" or prepared for market in a feeding demonstration conducted by the United States Department of Agriculture. The three at the top were fed only corn and a mineral mixture. The three at the bottom were given corn, skim milk, pasture, and a mineral mixture. Skim milk and pasture accounted for the difference. The photograph strikingly illustrates the values of a mixed diet in which the nutrients are balanced, providing not only for the development of fat and bone, but for blood, flesh, muscle, hair, and energy. Pigs fed balanced rations are profit makers, those fed corn alone are decidedly unprofitable and unthrifty. Study the feed and watch the profits grow.—E. J. Shelton, H.D.A., Senior Instructor in Pig Raising.

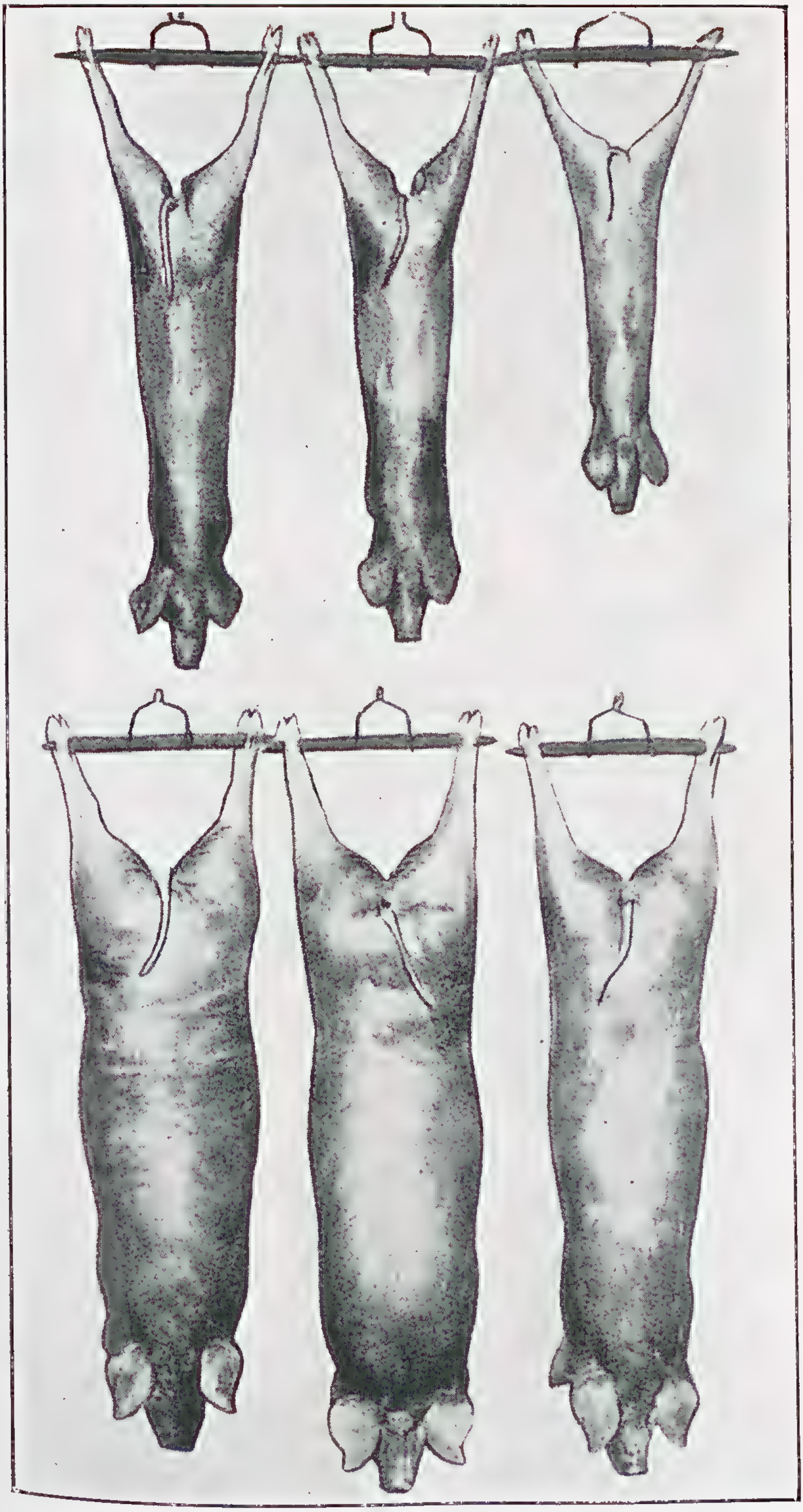


Plate 3.
Balanced Rations for Pigs—Proof that it Pays to Feed More than Corn to These Animals.

THE PIG FARM.

ACCOMMODATION AND EQUIPMENT.

By L. A. DOWNEY, H.D.A., Instructor in Pig Raising.

The necessity of good accommodation for pigs has frequently been mentioned in educational propaganda in recent years, and we can now say that the majority of pig raisers in Queensland are well aware of the many advantages of having pigs kept under comfortable and hygienic conditions.

Queensland's climatic conditions offer many natural advantages to the stock raiser, the chief of which is the comparatively mild temperature throughout the year, which dispenses with the need for expensive housing to maintain stock in warm conditions during winter months. In these notes Mr. Downey offers many practical suggestions.

THE main objects to be borne in mind when planning a piggery are:—

(1) Sufficient enclosures to keep the stock under control;

(2) Comfortable housing for stock;

(3) Shade during the hottest weather;

(4) Water and food supplies;

(5) Convenience for working the piggery; also

(6) The cost must be carefully watched.

Contrary to the old idea that the piggery was necessarily an objectionable and unsightly section of the farm, this profit-making section can be made attractive and quite inoffensive with comparatively little expenditure, provided that the accommodation for the pigs is set out on correct lines.

The type of piggery to be constructed naturally is determined by the locality, the extent of the pig raising operations, and the nature of the food supply. Most pig raising ventures in Queensland can be classed under the following headings:—

(*a*) Butter-milk piggeries;

(*b*) Suburban piggeries;

(*c*) Slaughter-house piggeries;

(*d*) Agricultural and dairy farm piggeries, and there are a greater number of farmers engaged in pig raising under the last heading, than under the other three headings combined.

Pig accommodation is controlled to some extent by legislation, particularly as regards pigs being kept on slaughtering establishments, butchers' premises, and registered dairy farmers' premises; therefore it is advisable for persons about to construct piggeries or to alter the construction of piggeries on such premises to advise the local inspector, so that guidance may be given for construction in accordance with the Acts concerned. In some shires and municipalities, local by-laws are in operation regulating the building of piggeries, and therefore the Local Authorities should be consulted before building piggeries.

Remembering the many advantages of grazing pigs under what is usually termed the "Paddock System," every effort should be made, in planning a piggery, to provide ample grazing area for all pigs, either on natural pasture or on specially cultivated crops.

Butter-Milk Piggeries.

Under this heading are included some of the largest specialised piggeries in the State. The main source of food supply being the by-products of the dairy factory, this is usually conveyed from the factory to the farm by a pipe-line, although sometimes carted in tanks, and on these farms numbers of pigs ranging from 100 to 1,000 are usually found. These butter-milk piggeries are necessarily situated fairly convenient to the dairy factory, and this must be the chief point in consideration of a site for such a farm, even at the expense of utilising land that is not productive of good crops for pig foods.

However, with most butter-milk piggeries, situated handy to the butter factories, there is ample room for grazing paddocks for the pigs, even though the grazing may not be of the best quality.

On a piggery of this type, where a large number of pigs are to be kept, and it is necessary to economise in labour of feeding, the feeding arrangements must be conveniently situated, and where a large number of pigs are to be brought together for feeding, it is necessary to have concrete floors. Also if the pigs have to be housed together with a large number of animals on a small area of land, it will be necessary to have all their accommodation built on floors of an impervious and solid nature, preferably of concrete. However, in a case of this nature, it would be a distinct advantage to have adjoining paddocks where the pigs could be turned out for exercise.

Where pigs are obliged to remain confined in pens with concrete floors it will be necessary to provide a wooden sleeping platform where the pigs may lie and have no danger of rheumatism which often occurs when pigs are forced to lie continually on cold concrete. This wooden platform should cover a section of the concrete floor, sufficient for all the pigs to lie on, and may either be a movable section that could be removed for cleaning, or it could be made of 1½-in. grooved boards set in pitch and tarred over on top of the concrete.

Although the central pig house is usually to be seen on these buttermilk piggeries, there is no reason why the paddock system with individual houses should not be adopted so as to make fuller use of pastures for pigs.

Suburban Piggeries.

In close proximity to cities and large towns there are piggeries where the waste foods from hotels, boarding-houses, shops, and similar places, are put to good use as pig food. Similar piggeries are also run in conjunction with institutions such as mental hospitals and sanatoriums.

At such piggeries pigs are usually kept on an intensive system, and so well-constructed pens and sheds are built on a comparatively small area of ground. Again, this is only made necessary when land values are too high to permit of grazing paddocks.

Conveniences for cooking the food should be provided at these garbage piggeries and, of course, the peculiar system of feeding will also have some effect on the lay-out of the pens and feeding troughs.

Again, with the suburban piggery where pigs are confined to small pens, it is essential that they should have hard, impervious floors and a good drainage system; also it is necessary to have a plentiful water supply for cleansing purposes.

Slaughter-house Piggeries.

Slaughter-house piggeries are somewhat similar to buttermilk and suburban piggeries in that the pigs are usually kept on the intensive system, and so well constructed houses and pens and impervious floors and troughs are essential to good sanitation.

Boiling appliances are also necessary on the slaughter-house piggery, as all offal and meat fed to pigs must be thoroughly boiled.

In all of the three types of piggeries just dealt with, the fullest possible use should be made of direct sun rays as a disinfectant and deodoriser, also plenty of ventilation should be provided in the houses without allowing direct draughts on to the pigs.

Agricultural and Dairy Farm Piggeries.

This section includes the largest number of pig raisers, as practically every dairy farmer and every mixed farmer keeps at least a few pigs, while some make pig raising a most important section of the farm. The accommodation most suitable on such farms will depend upon the extent of the pig raising operations, but no matter how large or how small the venture should be, it is essential that sufficient accommodation of the correct kind should be provided.

It is most important in planning the piggery that a survey should be made of the extent to which the pig section of the farm may grow, and that the whole undertaking should be planned out on a definite system, because without system the piggery is a muddle. A farmer should reckon out the number of breeding sows he is likely to use and the accommodation he will need for those sows and the boar and their progeny, also an estimate should be made of the amount of grazing and cultivation land that will be required to grow feed for the number of pigs.

In choosing the site for the piggery, consideration should be given to aspect to provide shelter from prevailing winds and to make best use of early morning sun; for these reasons the northerly to easterly aspects will usually be found most suitable. If the paddocks can be made on a slope to give good surface drainage it will be a decided advantage, especially in wet seasons. Where separated milk from the dairy farm is to be used at the piggery an effort should be made to have the piggery situated down the slope below the separating room so that the separated milk may gravitate to the piggery in a line of open galvanised gutter piping, or even if it is necessary to carry or wheel the skim milk from the dairy it is easier to convey it down to the piggery than up to the piggery.

The available water supply, shade, and proximity to cultivation land are other points to be considered.

Although it means economy in fencing to have square paddocks, when pigs have to be fed in their own respective paddocks it would mean carrying food too far to each trough, and for this reason the piggery will be more convenient to work if long, narrow paddocks are provided. However, the paddocks should be large enough to allow of cultivation if necessary, also large gates or movable hurdles may be used at one end of the paddocks to allow entry of horses and implements.

Fig. 6 showing the layout of a piggery with sufficient paddock and shed accommodation for six sows and a boar and their progeny (up to six months of age), will be found a most convenient and suitable system for many dairy and agricultural farms. This system provides a paddock for dry brood sows, a small paddock for the boar, two paddocks for sows with litters until they are weaned, and four paddocks for growing pigs. These paddocks should provide ample room for running the pigs in small numbers, and one of the paddocks could occasionally be utilised for cultivation of crops to be grazed off by the pigs.

The system aimed at in this lay-out is to have the six sows divided into three lots of two, having two sows to farrow every two months; this can be fairly well regulated when the boar is kept in a separate pen from the sows, and it gives more control over the breeding and provides a regular supply of pigs throughout the year, particularly when crops are grown regularly to supplement the milk supply. Thus there is always ample grazing room for all pigs, and faster gains are made by the stock and losses from disease are minimised.

Although the sheds shown in this plan are double sheds placed over the dividing fences, other individual sheds, either fixtures or movable, on skids, could be used. Concrete feeding floors and troughs are shown, but although these are most satisfactory they may be replaced by well-made wooden troughs.

All the paddocks are shown leading out into a cultivation paddock at the bottom of the run, such a paddock cropped with lucerne to be either grazed off in sections by the pigs, using movable hurdles to control the feeding-off, or to be cut and thrown over to the pigs in their runs, provides a very valuable food supply for the pigs.

With all piggeries a convenient loading arrangement is a necessity, and so provision must be made for either a portable or a fixed race to run the pigs from the yard into the cart or lorry. The accompanying plan of the dairy farm piggery provides for a 16-ft. laneway leading to a loading race at one end, and with movable hurdles for moving pigs from one paddock to another or up to the loading race.

Quarantine Pen.

It is advisable to provide a quarantine pen some distance from other pens, where newly introduced pigs and sick pigs could be placed and kept under observation. This is an important safeguard against outbreaks of disease.

Sheds.

There are numerous types of sheds suitable for different piggeries, and the type most suitable to a particular farm will have to be determined by the farmer, and conform with his local conditions. Certain requirements are general in all piggeries, firstly, the size. A shed suitable to use for a sow and litter or about ten growing pigs, or a boar, or about four brood sows would need to have a floor space of approximately 8 by 8 feet, but extra space in a shed is an advantage; also, with larger sheds, temporary partitions can be used to provide a number of separate sections. The height of pig houses should be sufficient to allow a man to move about inside without difficulty; nothing under 5 feet is satisfactory.

Considering Queensland's warm climate, ample provision should be made for ventilation, and yet there should be no cracks about the lower portions of the sheds to allow direct draughts to blow on to the pigs and cause chills.

It is advisable in planning pig houses to so arrange walls and doors as to have direct sun-rays into every part of the floor where practicable, and for this reason the open-fronted shed faced to the north-east can well be recommended. In some particularly wet districts, however, it may be necessary to have the front of the shed practically closed to prevent drifting rains from wetting the sleeping floor.

In selecting materials for building pig houses, the costs of various suitable materials will largely influence their choice, but in general corrugated galvanised iron roofs, wooden walls, and floors of concrete and wood or wood alone will be found most satisfactory.

Central Pig Houses.

These are found to be most suitable for buttermilk piggeries, slaughter-house piggeries, and suburban piggeries. Figs. 2, 3, 4, 5, and 9 illustrate this class of building which is of a more solid and permanent structure than small individual houses. In this type of pig house where large numbers of pigs are to be fed, impervious floors, preferably of concrete with wooden sleeping platforms, are essential. There should be a sanitary drainage system, and all drains should be shallow, smooth, and free from corners, and open to the sunlight, also the drainage must be delivered away to where it will not cause a nuisance.

In the large central pig houses where there is continual dampness around the feeding troughs, the use of concrete walls is very beneficial as they withstand the moisture better than do wooden walls.

Outdoor Double Sheds.

This type of shed, although different in many respects to the central type of house, has the idea of making one large shed do the work of two small sheds and thus saving one end wall, as it is only necessary to have a low partition between the two sections of the shed. This type of shed, as shown in figs. 12 and 13, is very useful under the paddock system; it is easily constructed and, where the paddocks are large, there is no necessity for special drains with this shed; this also applies to the smaller single sheds.

If it is necessary at any time to lock pigs in the open-fronted shed, a temporary hurdle can easily be erected along the front.

Pig houses with wooden floors should have the floors built from 6 to 12 in. off the ground in order to keep them dry and so that the ground under the floors may be kept sanitary.

Outdoor Single Sheds and Portable Sheds.

These are similar in design to the double sheds except that being complete for each paddock the sheds may be placed away from the dividing fences.

When the single shed is to be used in pig paddocks the best method of building same is to put it on runners, that will serve a double purpose of keeping the floor

boards up off the ground and also the runners can be used as skids; thus the shed is portable, and could be hauled about the farm with a team of horses or a tractor. This practice has many advantages and, for most Queensland pig raisers, this type of single portable house will be found the most serviceable.

Portable houses can be moved from one paddock to another when crops are being grazed off by pigs, and the shed can easily be removed from one part of a paddock to another, in order to sweeten up the ground or to allow cultivators to work.

Guard Rail.

All farrowing houses should be fitted with a guard rail to prevent young pigs from being crushed against the walls. Experience has proved that the use of this rail has saved an appreciable percentage of young pigs. This rail can be constructed of 3 by 2-inches hardwood, 1-inch water piping, or saplings. It should be placed 9 inches above the floor and 7 inches from the walls.

Fences

The class of fence to be used on each farm will be governed mainly by the available material for its construction.

Pig fences need to be from 2 feet 6 inches to 4 feet in height, depending on the class of pigs to be enclosed. Large boars and sows sometimes have a tendency to jump fences, and for such animals a 4-feet fence would be necessary; however, a fence 3 feet high is usually sufficient to control pigs of all sizes, while young pigs are usually kept in their places by 2 feet 6 inch fences. To overcome this difference in the required heights of fences posts should be put 4 feet out of the ground so that the height of the fence may be raised to 4 feet, if necessary, by the use of extra barbed wire.

With pig pens it is a fairly constant rule that the smaller the pen the more substantial fences must be, the reverse also holds.

It is usually advisable to have a line of barbed wire, either on the ground level or a few inches below to prevent pigs from rooting under fences; logs or stones can sometimes be used to the same purpose.

The posts of pig fences should never be placed more than 10 feet apart, and 8 feet would be better. Several types of fences are satisfactory under certain conditions:—

Post and three-rail fences are most serviceable for large pigs, and can be made proof against small pigs by the addition of wire netting 18 inches high. This fence, however, is only suitable where timber is cheaply available and where there is not so much risk of fire and white ants.

Posts and wire netting alone seldom make a good fence except for weaner pigs, as the wire sags and is easily torn by large pigs. However, wire netting of stout gauge is useful in patching up other fences, such as ordinary cattle fences, to make them pig proof.

The post and two-rail fence covered with split or sawn palings is suitable for some piggeries. The palings should be strapped on with hoop iron at the top and bottom. As is the case with all wooden fences, there is a danger of fire and white ants. The paling fence has the advantage of acting as a break-wind in the piggery.

The other type of paling fence where either sawn or split palings are used and are held in position between two interwoven plain wires at the top and bottom of the posts is very common and very useful where timber is plentiful. Saplings or slabs may also be used in the same fashion, interwoven with the two wires top and bottom. Perhaps the most satisfactory fence for pig paddocks is woven wire, which can be purchased at reasonable prices from hardware stores. Woven wire is made in various designs and especially for pig paddocks, some having a barbed wire at the bottom. The height of woven pig wire is about 2 feet 6 inches; this is sufficient for young stock, and if it is desired to increase the height of the fence, extra barbed wires may be placed above the woven wire. The panels of woven wire should not be more than 10 feet.

The use of a few extra barbed wires is to be recommended on the fence of the boar pen.

A fence made of seven or eight barbed wires suitably placed on the posts is fairly satisfactory, but it is objectionable where young pigs are penned as a scratch from barbed wire is often carried by the young pigs to the bacon factory, and there shows up as a disfiguration on the carcass. Where wire fences are used it is advisable to either reinforce them or replace them by wood at the feeding end of the paddocks as there is most wear and tear on this part of the fence.

Troughs.

The piggery should be equipped with troughs of sufficient capacity to feed the pigs without undue scrambling or fighting at feeding time, that is, sufficient space should be provided at the trough for each pig, an average space of 10 inches should be allowed for adult pigs. Also troughs should have the capacity to hold a full feed for the pigs.

Pig troughs should be strongly constructed and have a smooth surface free from corners or cracks. Where portable troughs are made they should be of a size which allows of them being easily carried on to new ground. With stationary troughs it is essential that they should be built on to a floor of concrete or brick to prevent the pigs from making an objectionable mud wallow beside the trough. Wooden slabs placed on the ground beside the feeding trough are very unsanitary even if they do keep the pigs out of the mud. Spilt food and drainage collects under the slabs and causes an objectionable odour. The feeding floor should always be of an impervious nature.

The most serviceable troughs are of concrete built into a concrete floor as shown in fig. 26.

The trough illustrated in fig. 26 is 14 feet in length and the width is 15 inches overall, having its sides of 2½-inch thickness, reinforced with barbed wire, lengthways. The trough is 5 inches deep and the inside width is 10 inches. The platform is 7 feet wide and 16 feet long and 4 inches in thickness, and is surrounded by a protective flange 4 by 2-inch hardwood, bolted together at corners to protect the edges of the platform from being broken away.

Improvements could be made to such a trough by making a bung in the end leading outside the pen to facilitate cleaning the trough. Also, if the end of the trough was projected outside the fence, food could be poured in from the outside. Iron bars of ½ inch thickness set into the concrete across the trough 10 inches apart prevent the pigs from fighting at the trough and also prevent pigs from rooting food out of the trough. In such a trough it is preferable to have all the internal corners rounded off in order to facilitate cleaning.

Movable troughs built of concrete are very serviceable in some circumstances.

The V-shaped wooden trough, as illustrated in fig. 27, is a very useful trough when concrete cannot be used. This type of trough can be made of varying sizes to suit requirements. One suited to general use is made of a 9 by 1 inch hardwood board and an 8 by 1 inch hardwood board secured by screwing or nailing together at right angles and the ends closed up by 9 by 1 inch hardwood boards. The timber must be sawn and tightly fitted to prevent leakages. A dressing inside and out of tar acts as a preservative on the wood, and also makes it watertight and more hygienic.

Cast and galvanised iron troughs of various designs are procurable from hardware stores, and these are quite satisfactory under certain conditions.

Self-Feeders.

In an interesting and informative article which appeared in the November issue of the "Queensland Agricultural Journal" in 1927, Mr. F. Bostock, now of the Hawkesbury Agricultural College, New South Wales, stated that—

A "self-feeder" is simply a device by means of which a supply of grain or other feeds may be kept constantly available to the pigs in order that they may satisfy the cravings of their appetites.

Self-feeders, as illustrated, are practicable when grain is being fed, and for this purpose are intended for use more especially during the growing and fattening stages in the life of the bacon pigs, and are not specially recommended for use in feeding breeding sows, though even for this purpose the self-feeder may be used, but if so used the mixture of foods should be more nitrogenous (flesh-forming) than is usually given to baconers. This is because breeding sows in general only require a limited allowance of grain.

The two types of self-feeders, as shown in the plans (figs. 32 and 33), should be built on skids or runners to prevent pigs rooting at the floors and to facilitate moving. If strongly constructed this method of transport will be found to be much easier and quicker than loading the feeder into a wagon or on to a sledge.

Self-feeders should be designed primarily to keep an available supply of grain constantly before the pigs, and at the same time protect the contents against waste due to wind and rain.

It consists of a hopper to hold the food and a trough below, into which the grain is allowed to flow, the sliding and hinged flaps regulate the amount of grain permitted to flow into the trough as the pigs eat it.

The hopper is made sufficiently large enough to hold several days' supply of feed, and the inside walls should be as smooth as possible in order not to prevent the flow of grain into the trough.

When it is desired to feed two or more foods separately in the same self-feeder, a partition may easily be placed in the hopper at any distance from either end.

The self-feeder should be placed on a wooden or concrete platform if possible, and if well constructed with first-grade timber and given a coat of paint about once every twelve months should give service for quite a number of years.

According to American experiments there is very little doubt which method is the more economical, and as shown by the results of a number of experiments the self-feeder system is advantageous in every respect. Its use results in larger daily gains in live weight, bringing the pigs to marketable weights at an earlier date, and although the feed is consumed more rapidly there is an actual saving in the amount of feed required to produce 100 lb. of gain. This is a fact of extreme importance and is well worth consideration.

Last, but not least, one of the advantages to be gained is the saving of time and labour. At the same time the farmer must not neglect the self-feeder; because he has filled the hopper with grain he cannot afford to forget about it. The old adage, "The eye of the master fattens his cattle," holds good when applied to the self-feeding of pigs. There are a number of things which may happen to the self-feeder if left without attention. For instance, the feed may block in the hopper, thus leaving the pigs with a "dead" self-feeder, or the feed may become soiled in the trough, making it unpalatable to the pigs.

A self-feeder is by no means a substitute for the knowledge of feeding. The self-feeder may be adapted to the feeding of any kind of grain, although shelled grain and ground foods are most commonly used. It may be used to feed maize on the cob, but in this case the feeder would be required to be of a larger size than shown in accompanying plans in order to hold sufficient grain to feed a number of pigs for several days without refilling.

Maize meal or barley would require a smaller opening to prevent too rapid a flow of grain than would, say, whole maize. It will be noted in the plans that the sliding and hinged flaps have been fitted with thumb screws so as it may be adjusted to suit the type of grain being fed.

Shades.

Pigs should be provided with ample cool shade in hot summer months, and this can be done by either planting shrubs or hedges or by building a framework of 3 by 2 inches hardwood and covering the top with bushes or thatching with grass. Where a clump of natural scrub can be left in the pig paddock, good shade is provided where the pigs can burrow away into the cool and sleep during the hottest part of the day.

Oiling Post.

An occasional application of oil to the pig's skin keeps it in a soft and healthy condition, and at the same time the oil destroys lice and other external parasites on the pig. A convenient self-oiler can be made by wrapping a bag or a rope around a post or a tree in the runs from the ground level up to a height of 2 feet, the bagging or rope is kept saturated with oil, and the pigs oil themselves by rubbing against the post. A mixture of six parts of waste oil and one part of kerosene is very suitable for oiling pigs.

[Photo. by courtesy of Principal, Dookie Agricultural College, Vic.

PLATE 4 (Fig. 1).

Pigs are most contented when allowed the range of succulent pasture paddocks.

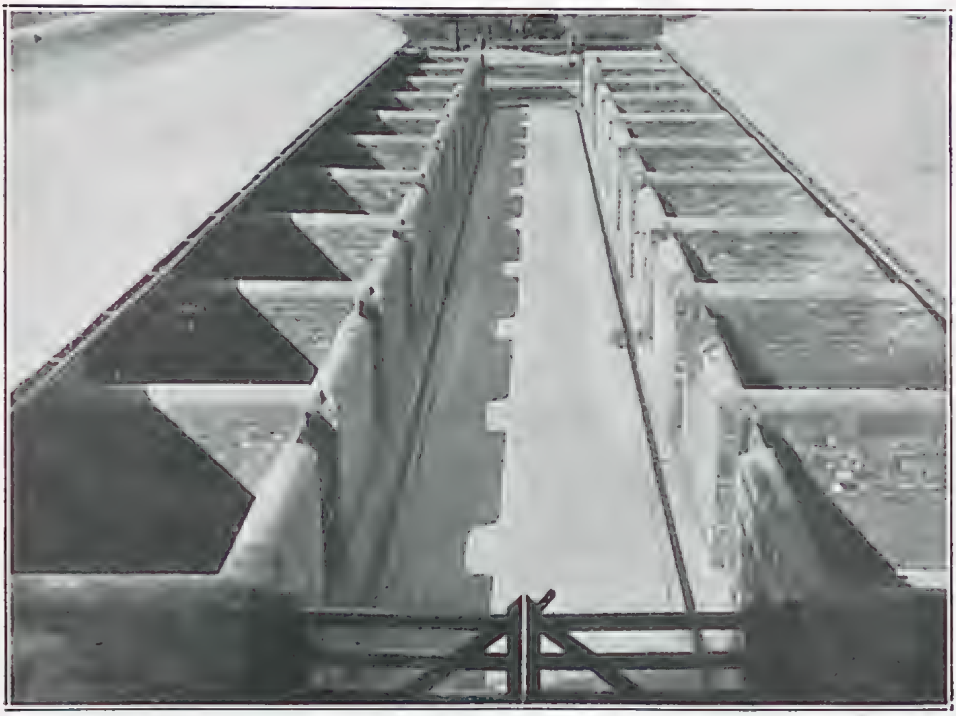


PLATE 5 (Fig. 2).
Piggeries, Mental Hospital, Goodna, Queensland, showing brick and concrete feeding pens, pathway, and drains.

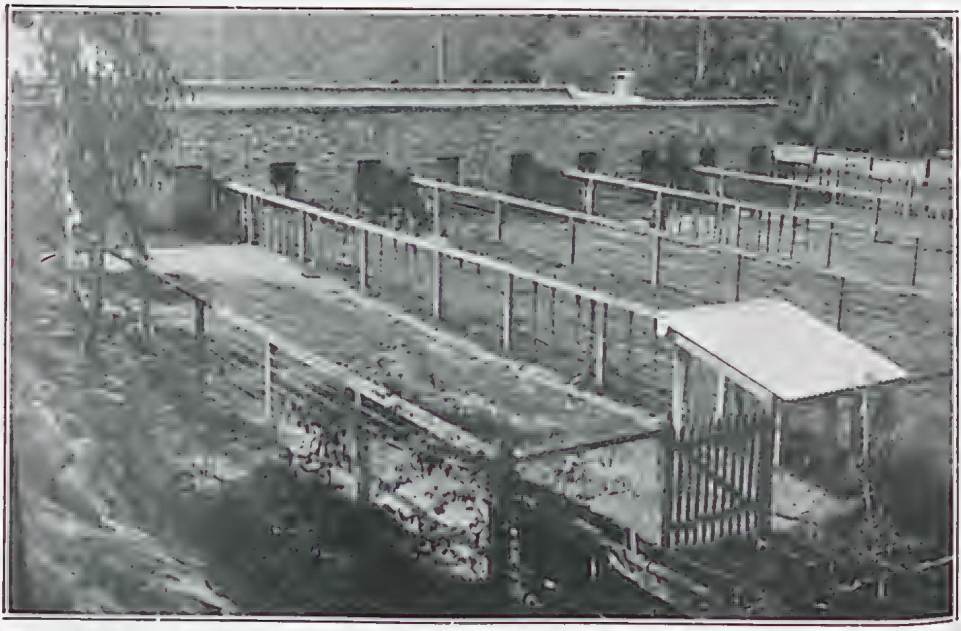
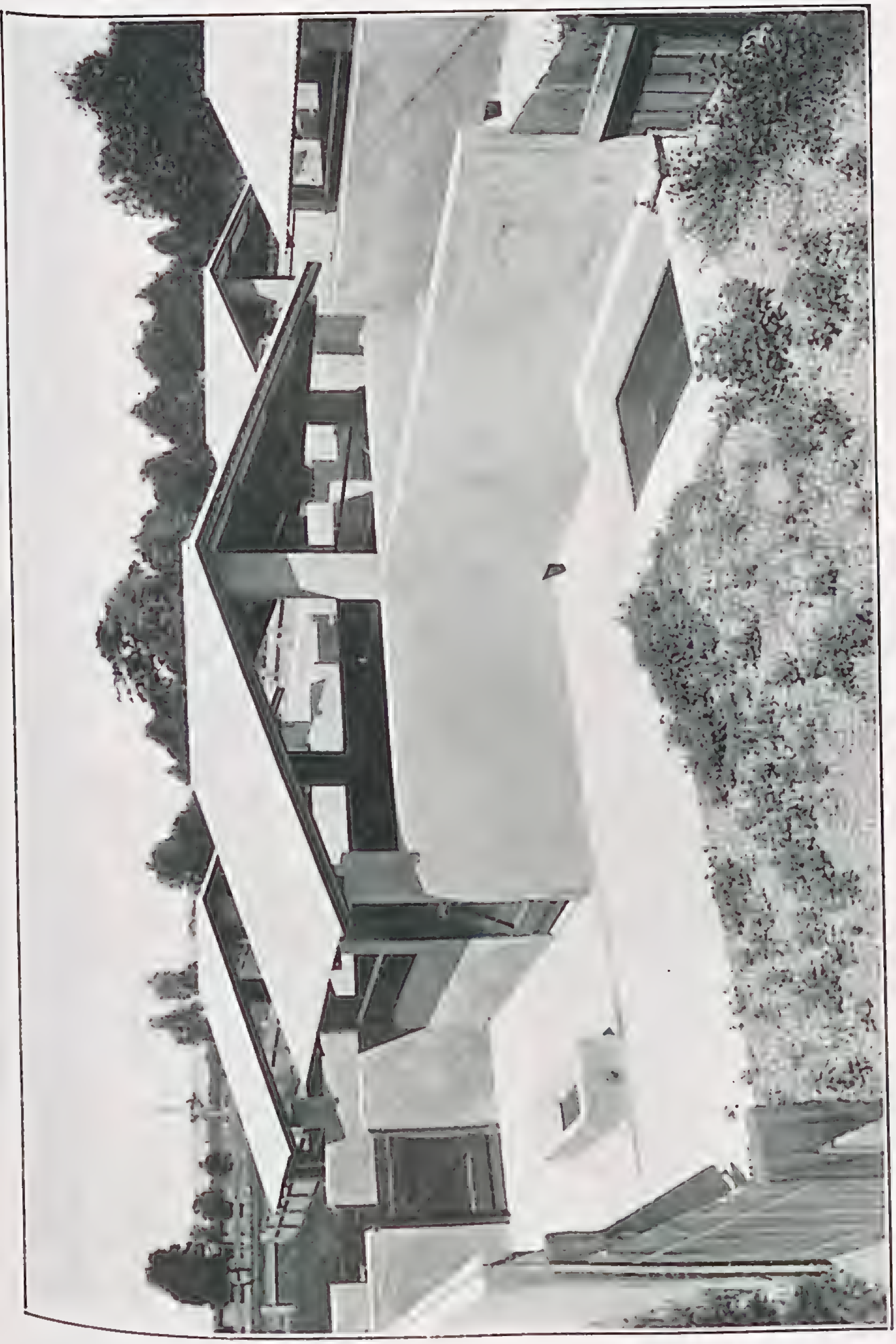


PLATE 6 (Fig. 3.)
Piggeries, Mental Hospital, Goodna, Queensland, showing exercise yards and shade at the rear of feeding and sleeping pens.



[Photo.: N. S. W. Government Printer.]

PLATE 7 (Fig. 4).

Section of Concrete Piggeries at the Hawkesbury Agricultural College, Richmond, N.S.W. This type of Piggery is suitable for suburban farms.

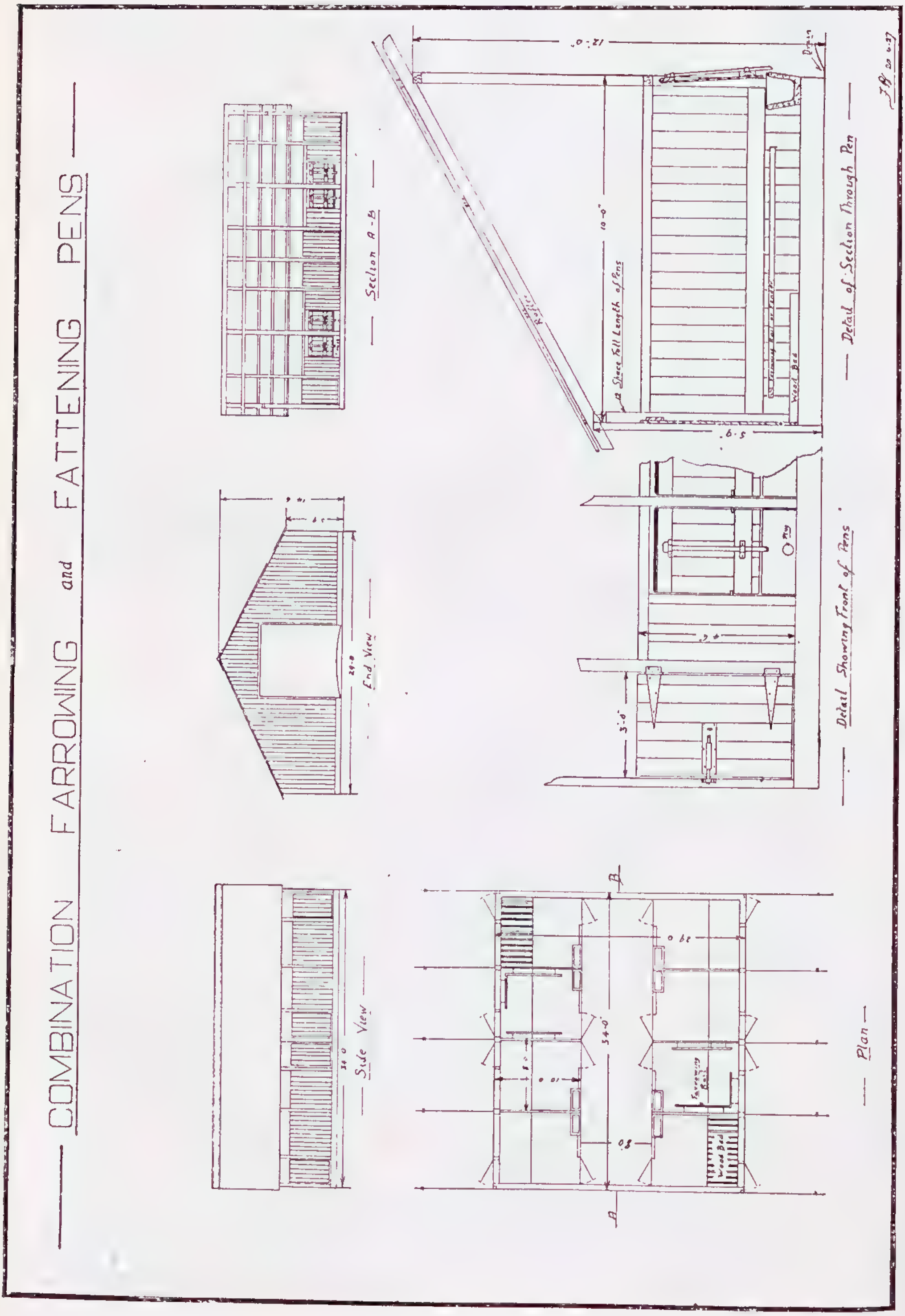

COMBINATION FARROWING and FATTENING PENS
Section A-B
End View
Side View
Plan
Detail of Section Through Pen
Detail Showing Front of Pens
Wood Bed
Farrowing Rail

PLATE 8 (Fig. 5).

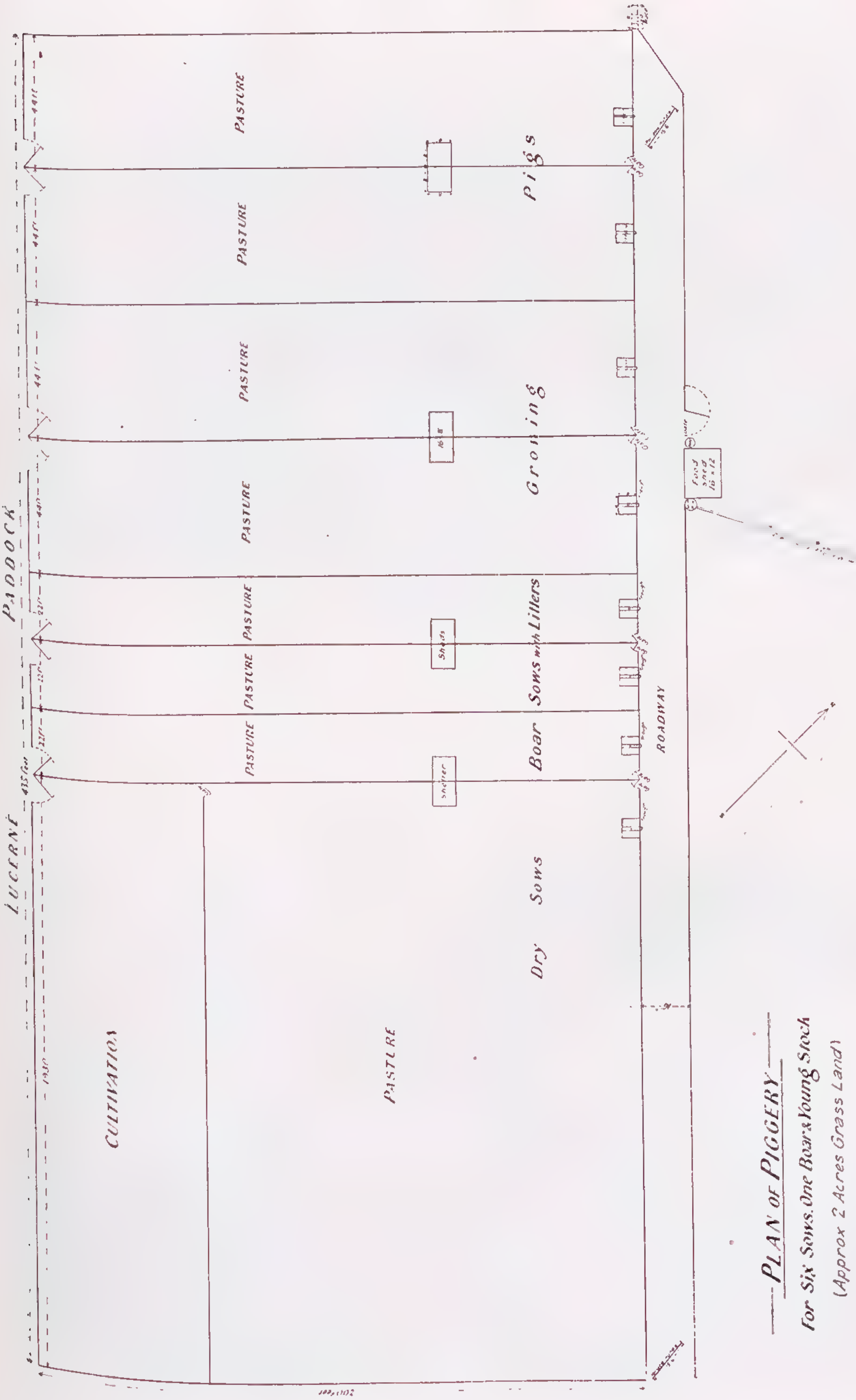

PLAN OF PIGGERY
For Six Sows, One Boar & Young Stock
(Approx 2 Acres Grass Land)
LUCERNE PADDOCK
CULTIVATION
PASTURE
Dry Sows
Boar
Sows with Litters
Growing Pigs
ROADWAY
Food shed
Shelter
Sheds

PLATE 9 (Fig. 6).

PLATE 10 (Fig. 7).

A section of the piggery at the State Farm, Kairi, Atherton Tableland, North Queensland, where pigs are run on lucerne and grass paddocks and provided with individual shelter sheds.

PLATE 11 (Fig. 8).

A useful type of portable loading race.

PLATE 12 (Fig. 9).

The central pig house in use at the Mental Hospital, Goodna, Queensland. This house has two rows of pens, with a passage and drains down the centre.

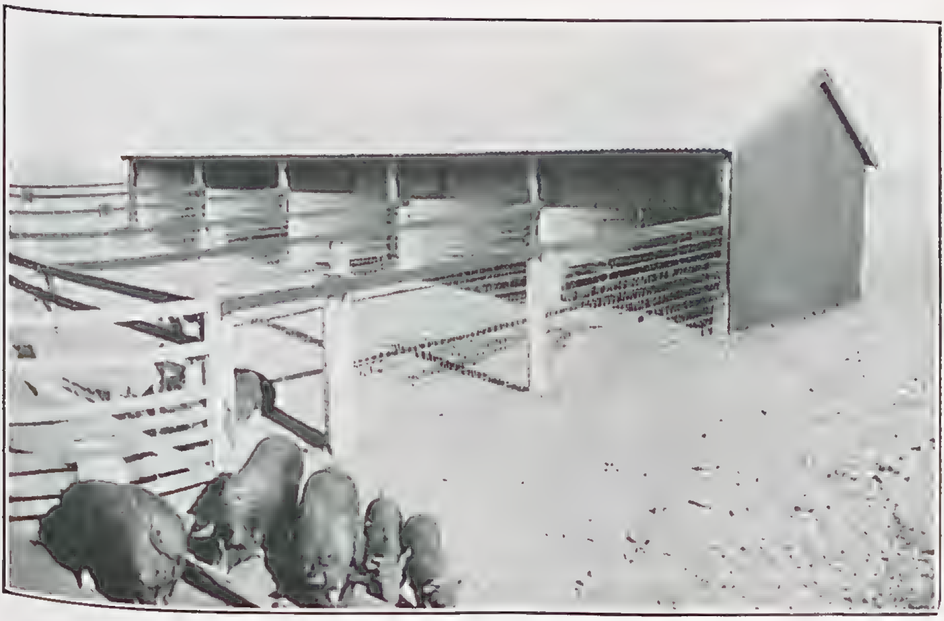


PLATE 13 (Fig. 10).

An attractive pig shed and yards on a Queensland farm.

PLATE 14 (Fig. 11).

Pig shed at the Kairi State Farm, Atherton Tableland, North Queensland. On account of the wet climate in that region the front of this shed is partially closed. It will be noted, however, that ample ventilation space is provided at the top of the walls.

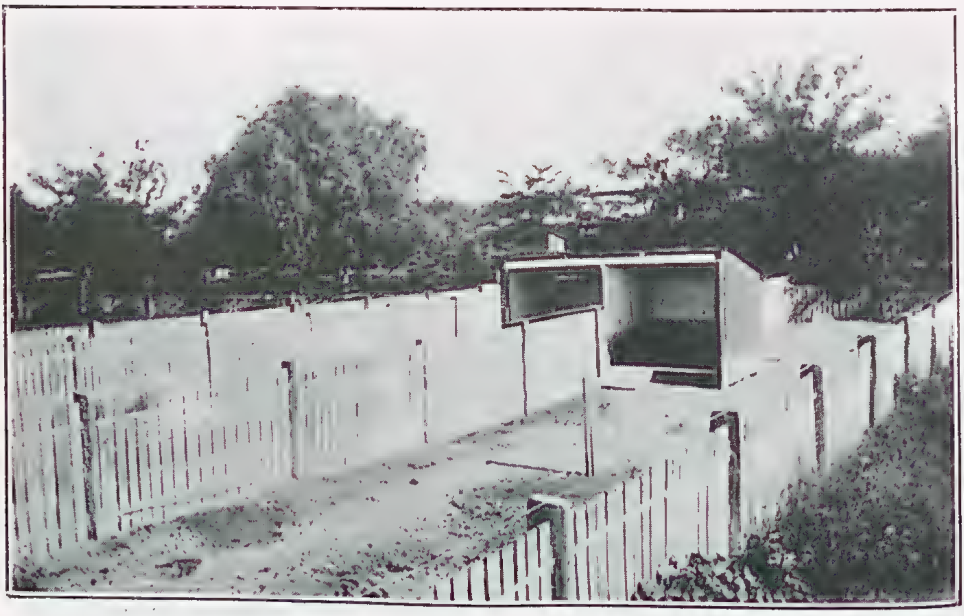
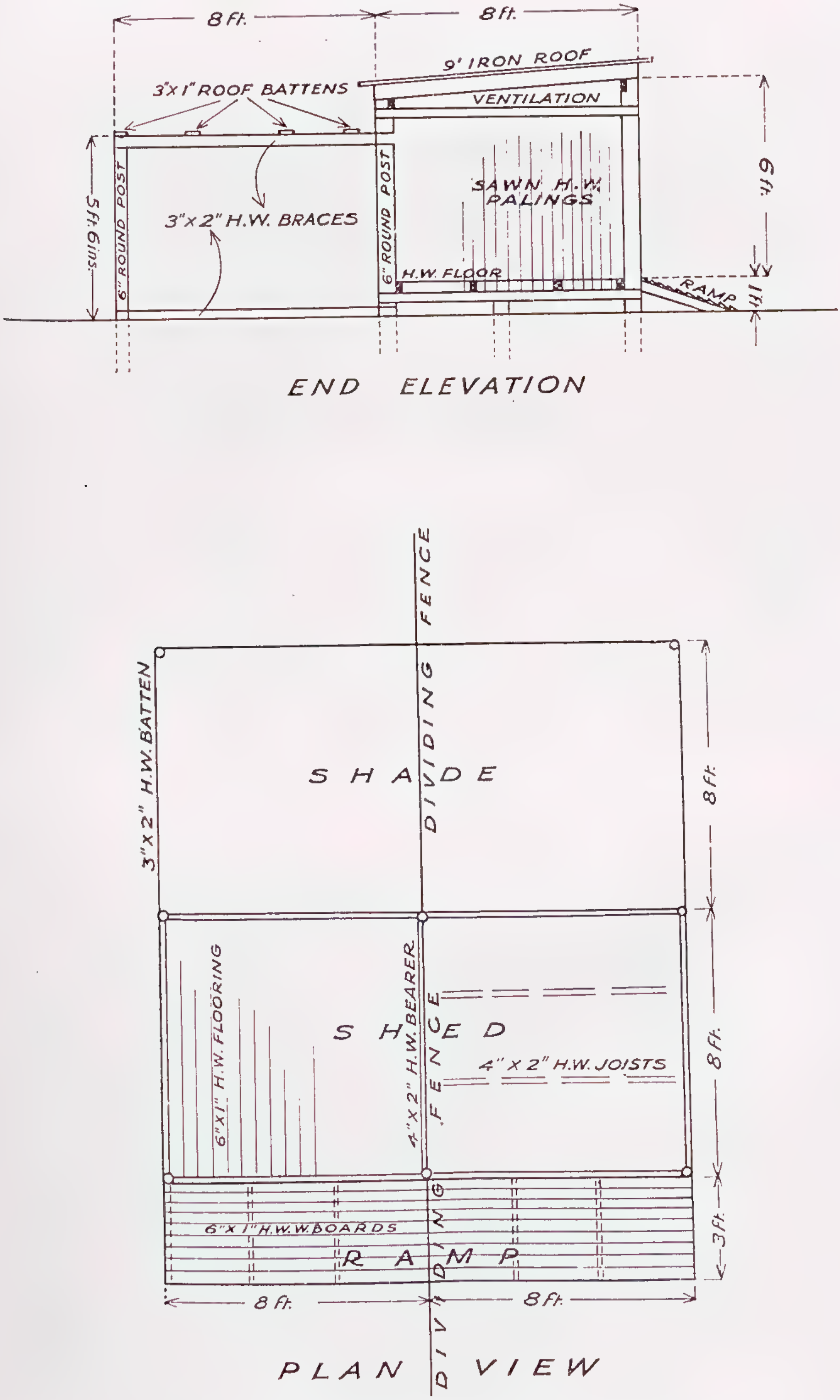


PLATE 15 (Fig. 12).

Double Pig Shed, divided by fence, at the Hawkesbury Agricultural College, Richmond, N.S.W. Note also the well constructed fences and shade trees for comfort of stock.



OPEN FRONTED SHELTER SHEDS FOR PIGS

Being a Double Shed with a Dividing Fence Ramp in Front and Brush Shade at Back

PLATE 16 (Fig. 13).

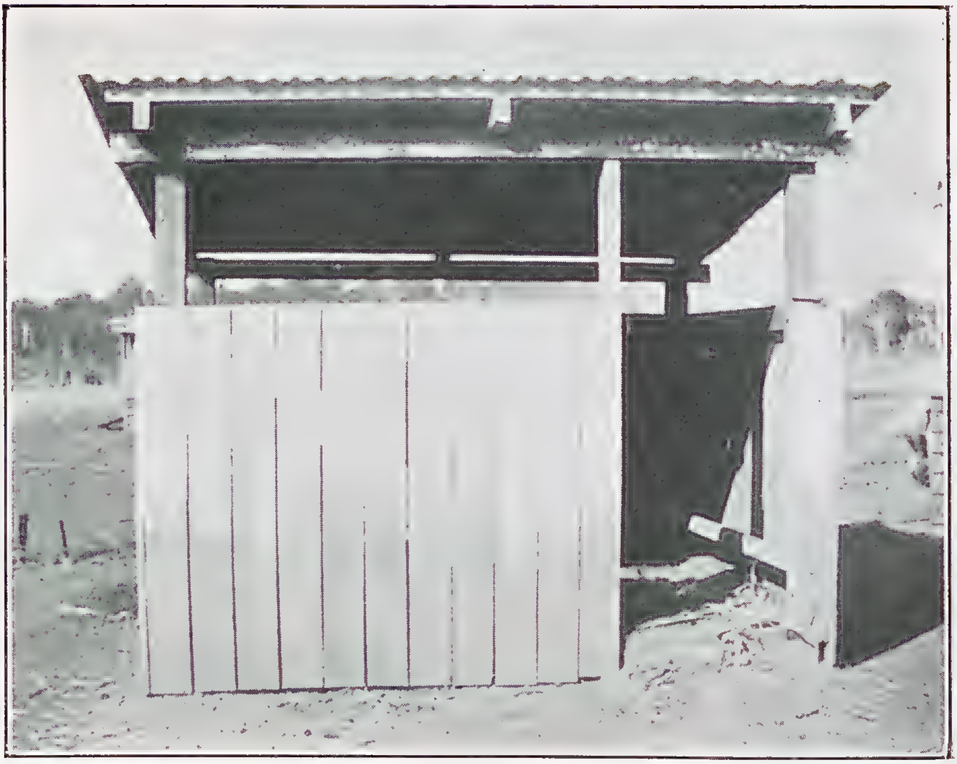
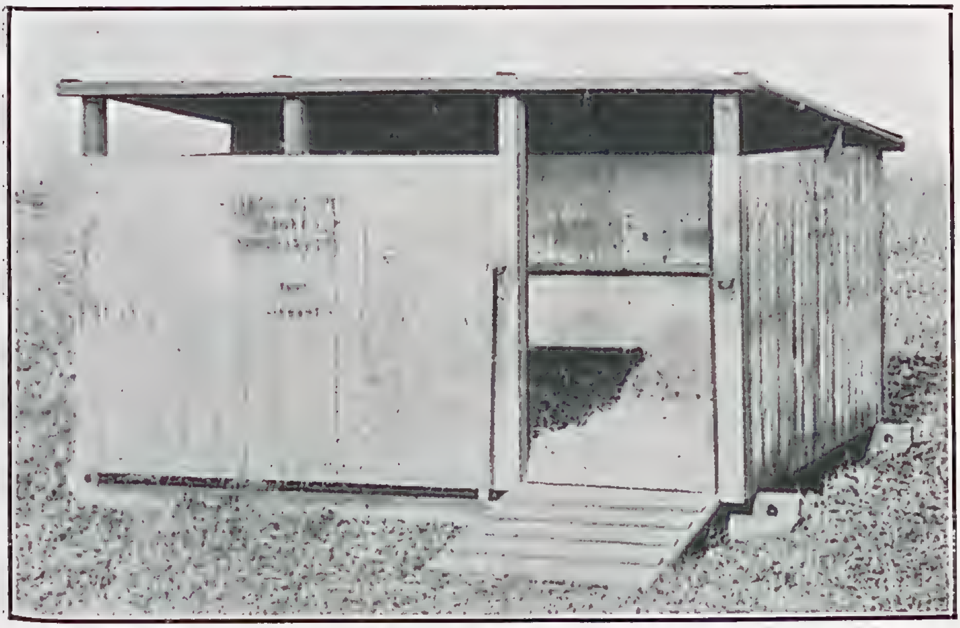


PLATE 17 (Fig. 14).
A single shed in use at the State Farm, Kairi, North Queensland. This shed is a fixture; its measurements are:—Floor, 9 ft. x 9 ft.; front, 6 ft. high; back, 5 ft. high.

PLATE 18 (Fig. 15).
A neat set of Single Sheds on the farm of W. Koehler, Yamsion, *via* Dalby, Q.



[Photo.: Ministry of Agriculture and Fisheries, Pig Keeping Publications, London.]

PLATE 19 (Fig. 16).

Portable Pig Shed photographed on an English farm. A convenient type for Queensland conditions.

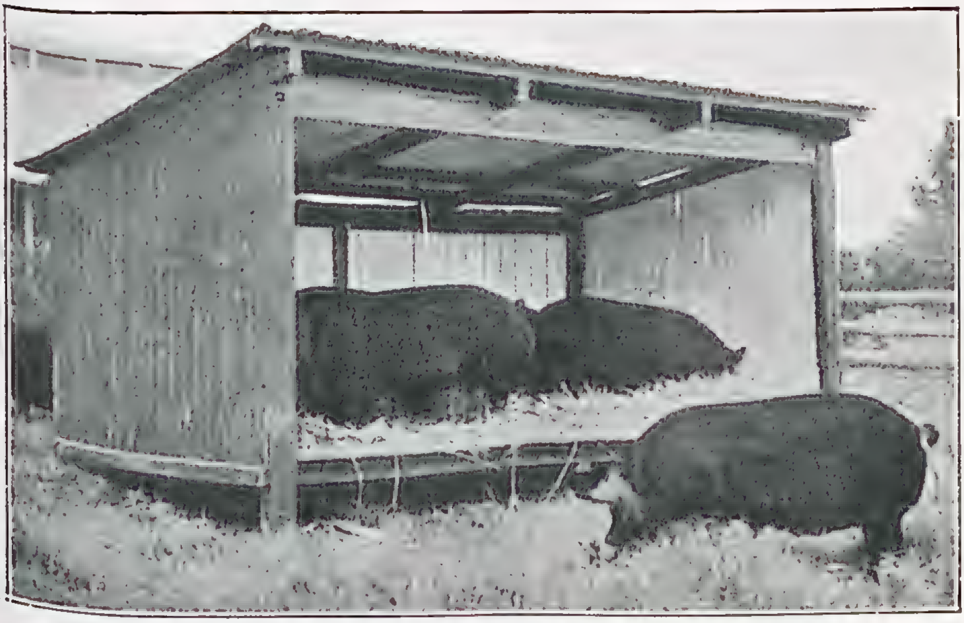


PLATE 20 (Fig. 17).

Open-fronted shelter shed at the Hawkesbury Agricultural College, Richmond, N.S.W. Berkshire Sows enjoying the advantages of this type of shed, which is suitable for most Queensland Pig Farms.

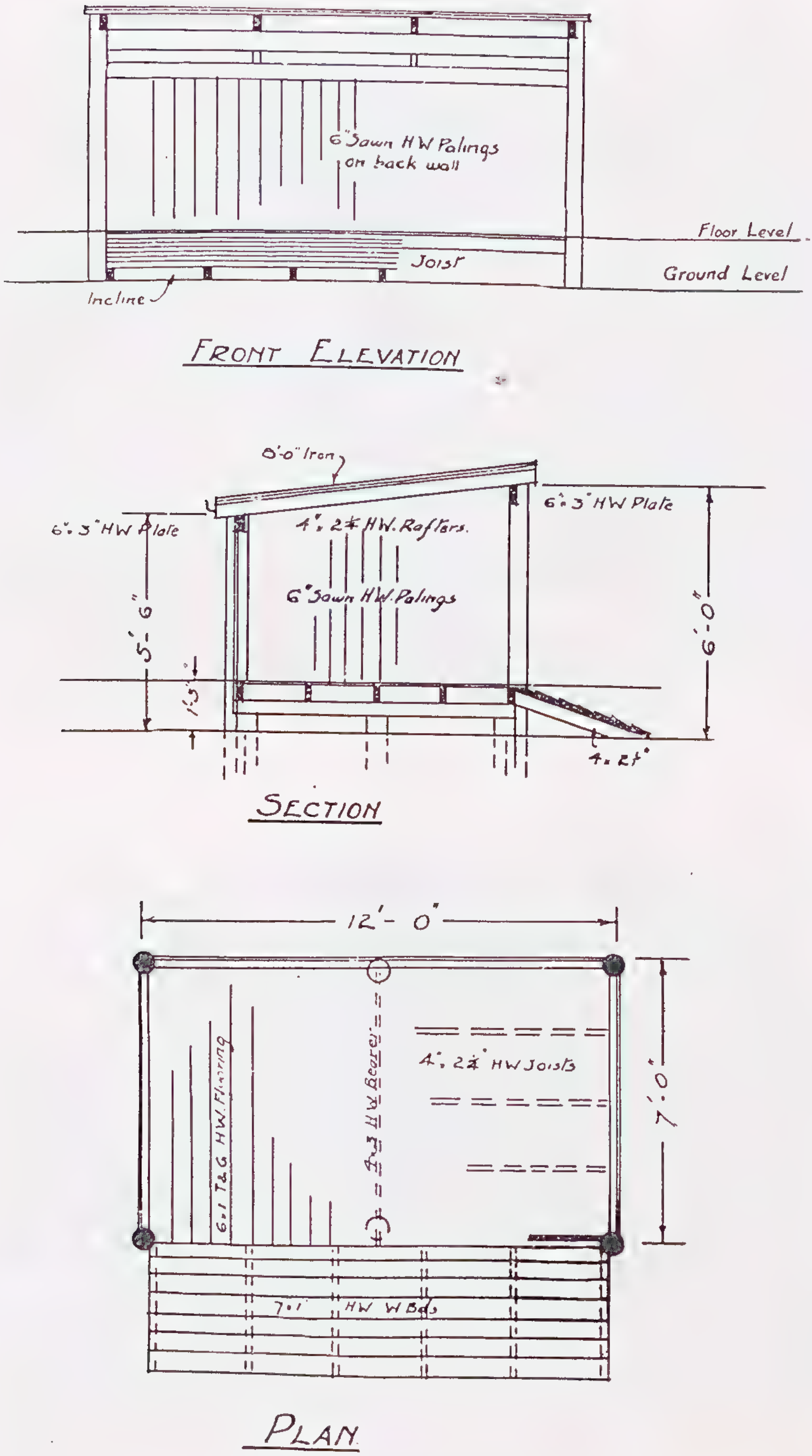


PLATE 21 (Fig. 18).
Plan for shed as shown in Figure 17.

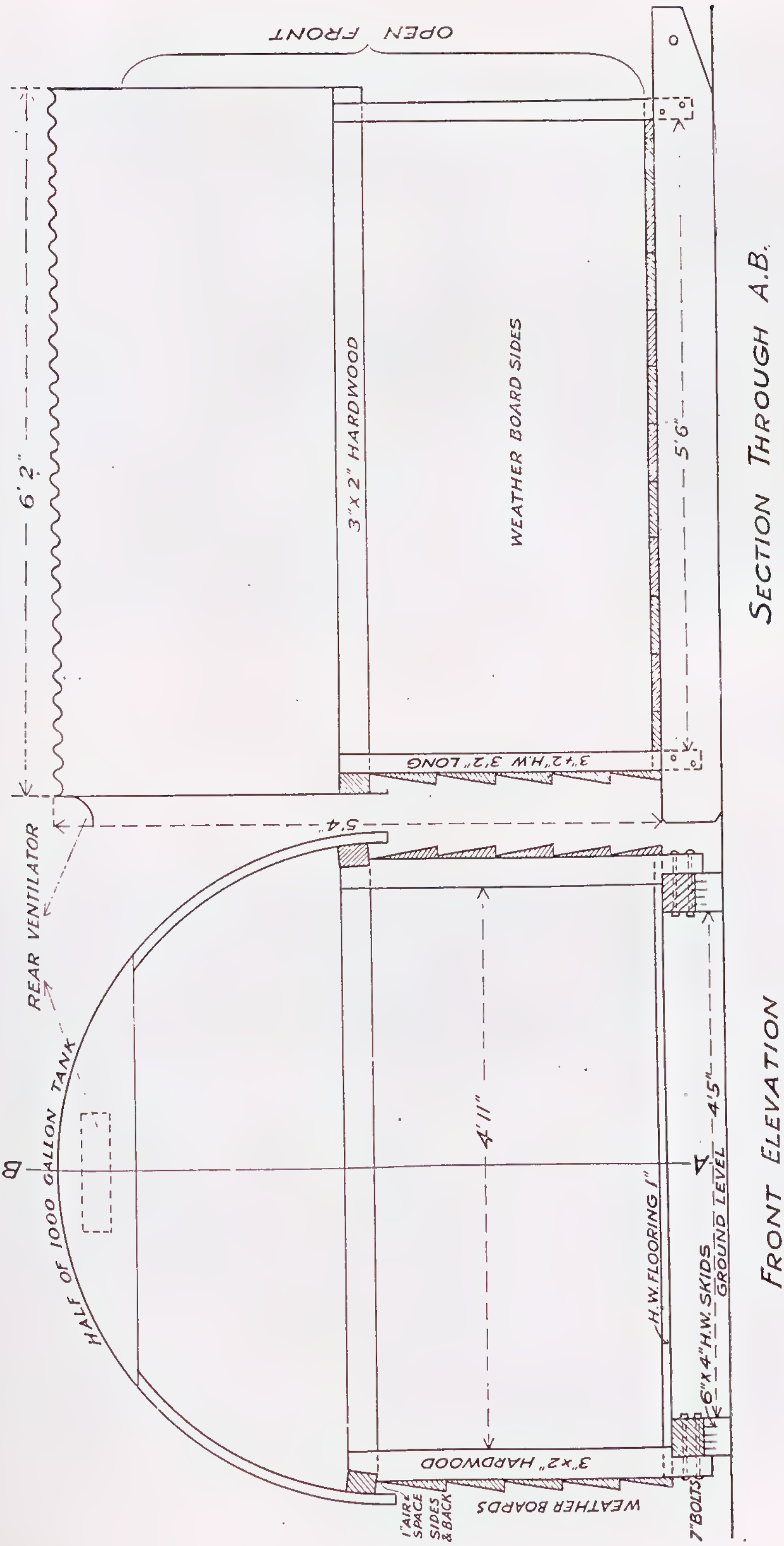


PLATE 22 (Fig 19.)—PLAN OF A PORTABLE SHELTER SHED, USING HALF A WATER TANK.

PLATE 23 (Fig. 20).

A substantial pig fence of three rails, made to hold young pigs by the addition of wire-netting to a height of 18 inches.

PLATE 24 (Fig. 21).

Woven wire fence strengthened by the addition of wire-netting and barbed wire.

PLATE 25 (Fig. 22).
Wire-netting fence, useful for enclosing small pigs.

PLATE 26 (Fig. 23).
A most serviceable fence of two rails and sawn palings. This class of fence can be used to advantage for small yards or enclosing large pigs.

PLATE 27 (Fig. 24)

This fence is made of 7 plain wires and a barbed wire at the bottom, posts are 10 feet apart, with four wooden droppers to each panel. It is suitable for holding large pigs, and the plain wires being through the posts can easily be strained when necessary.

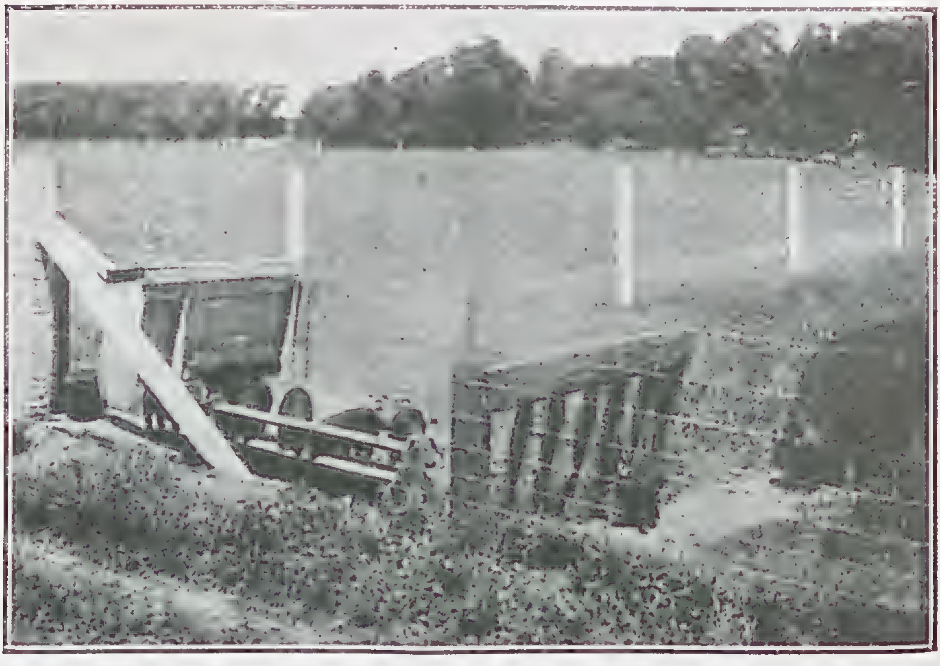


PLATE 28 (Fig. 25).

A Woven Wire Fence.—Note the wooden creep for feeding young pigs apart from the sow. This creep is so constructed that the suckers can get into the feeding pen, but the sow is blocked out; this permits of the suckers being fed a little extra food prior to weaning.

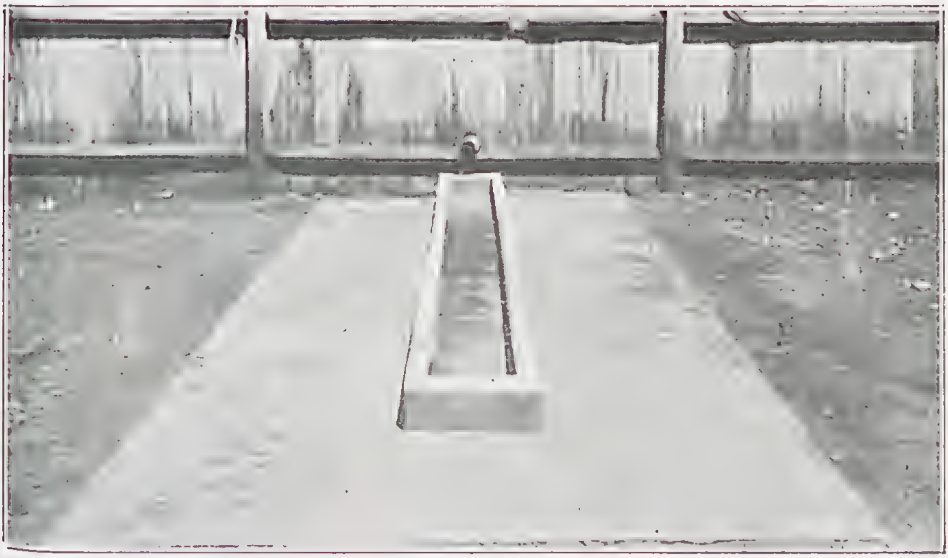


PLATE 29 (Fig. 26).
Concrete food trough and platform.

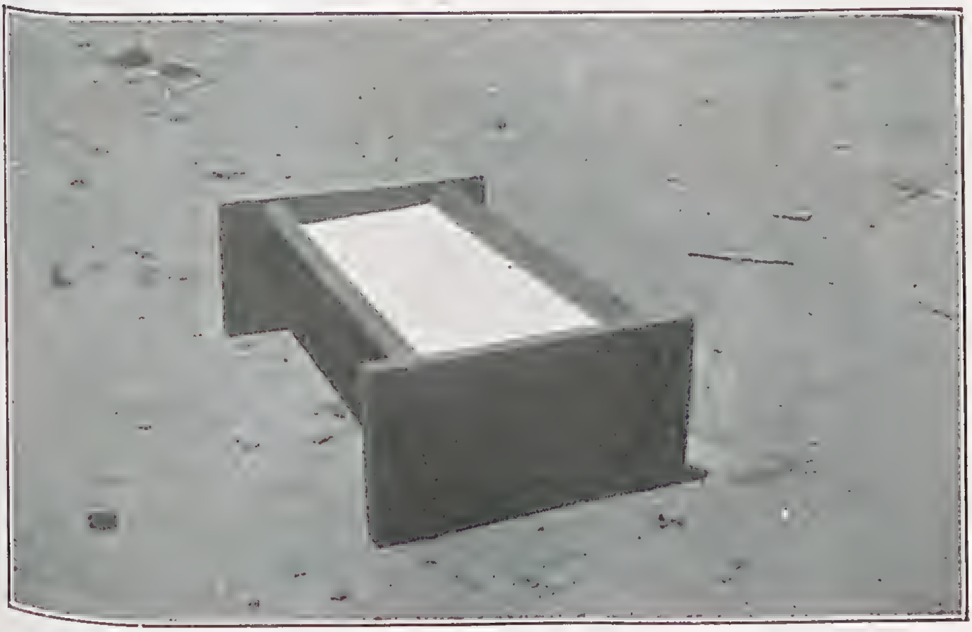


PLATE 30 (Fig. 27).
Breakfast is served. A handy V-shaped wooden trough.

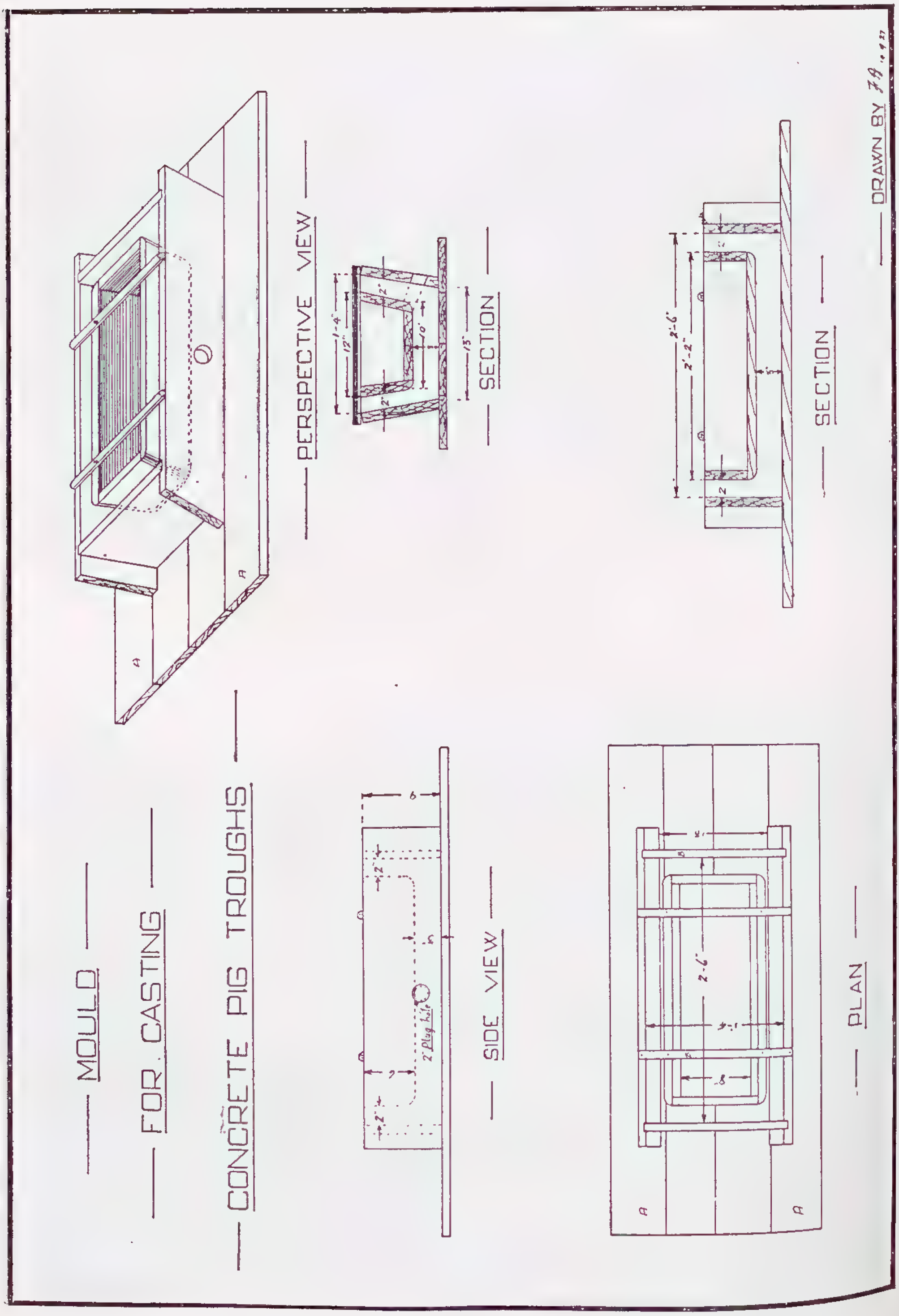


PLATE 31 (Fig. 28).

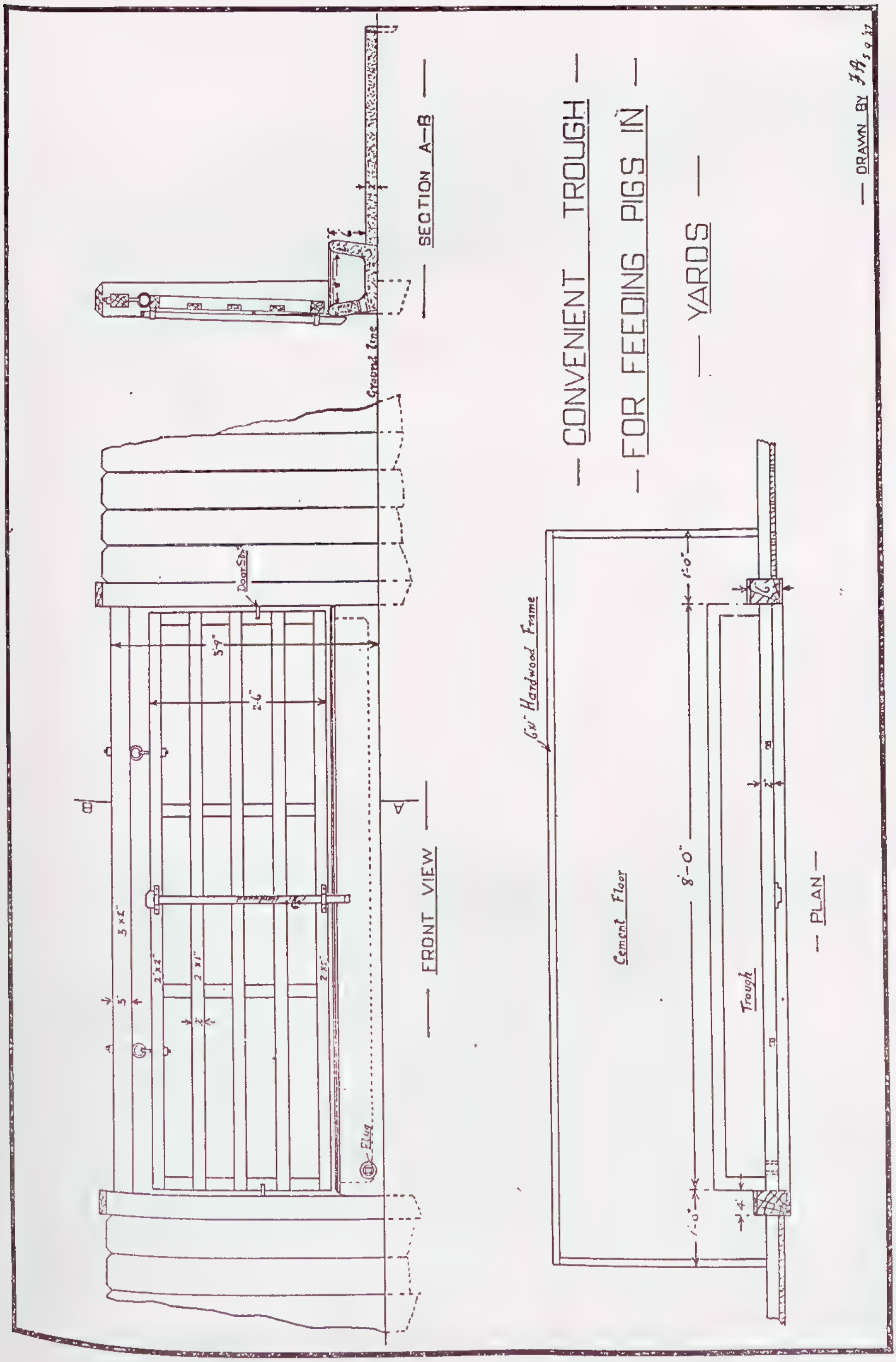


PLATE 32 (Fig. 29).

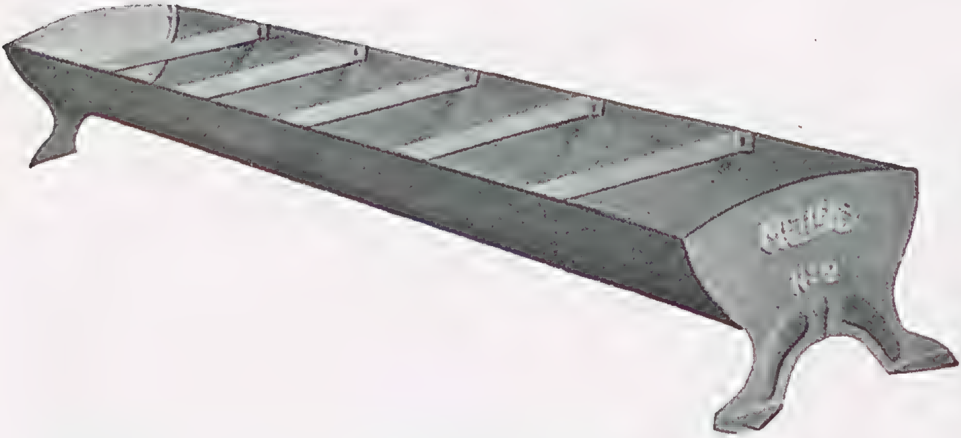


PLATE 33 (Fig. 30).
Steel pig trough, with cast iron ends, for feeding six pigs. Weight is about 40 lbs.

PLATE 34 (Fig. 31).
Feeding time for the Pig Farm Pets.

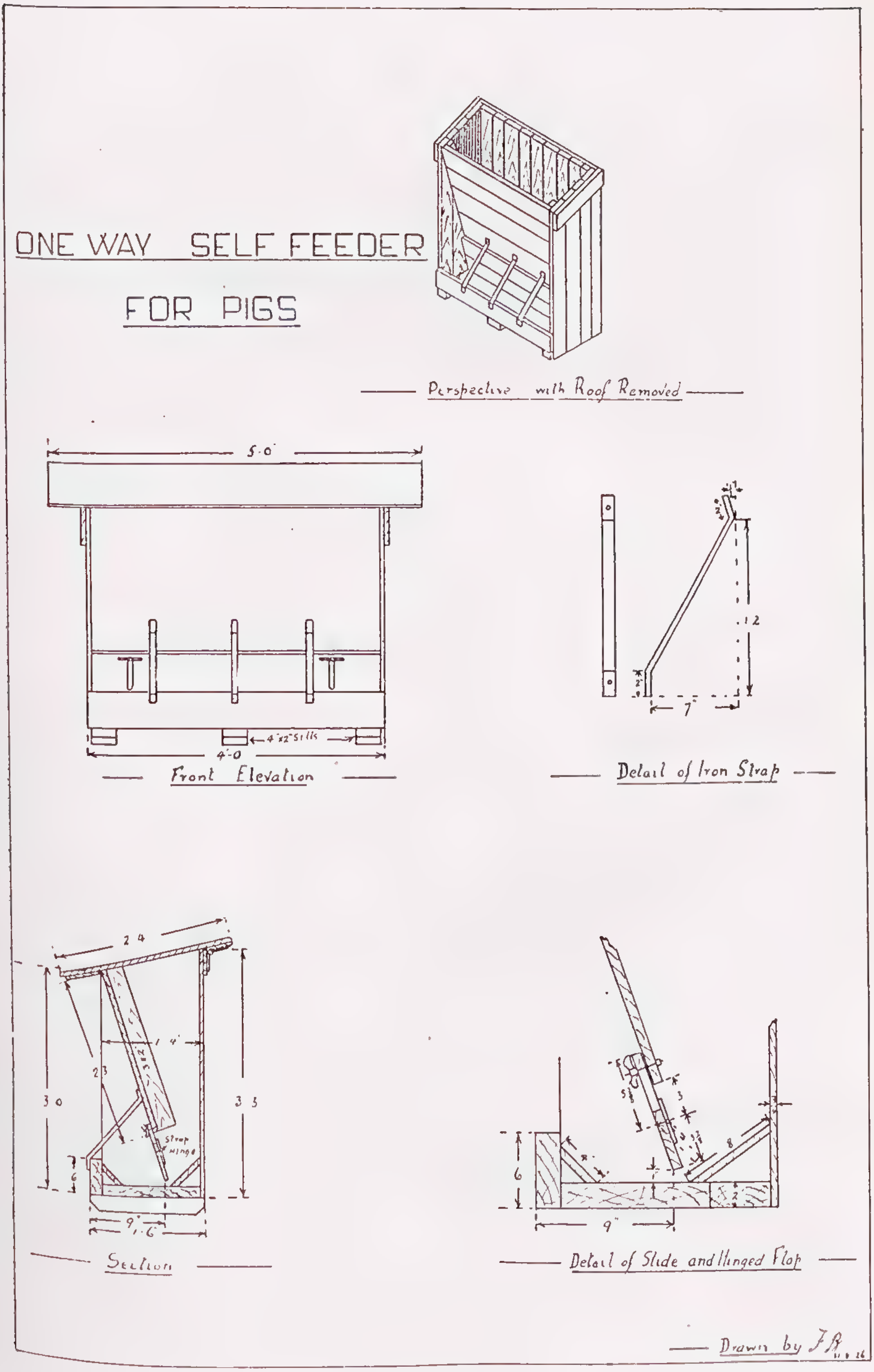


Plate 35 (Fig. 32).

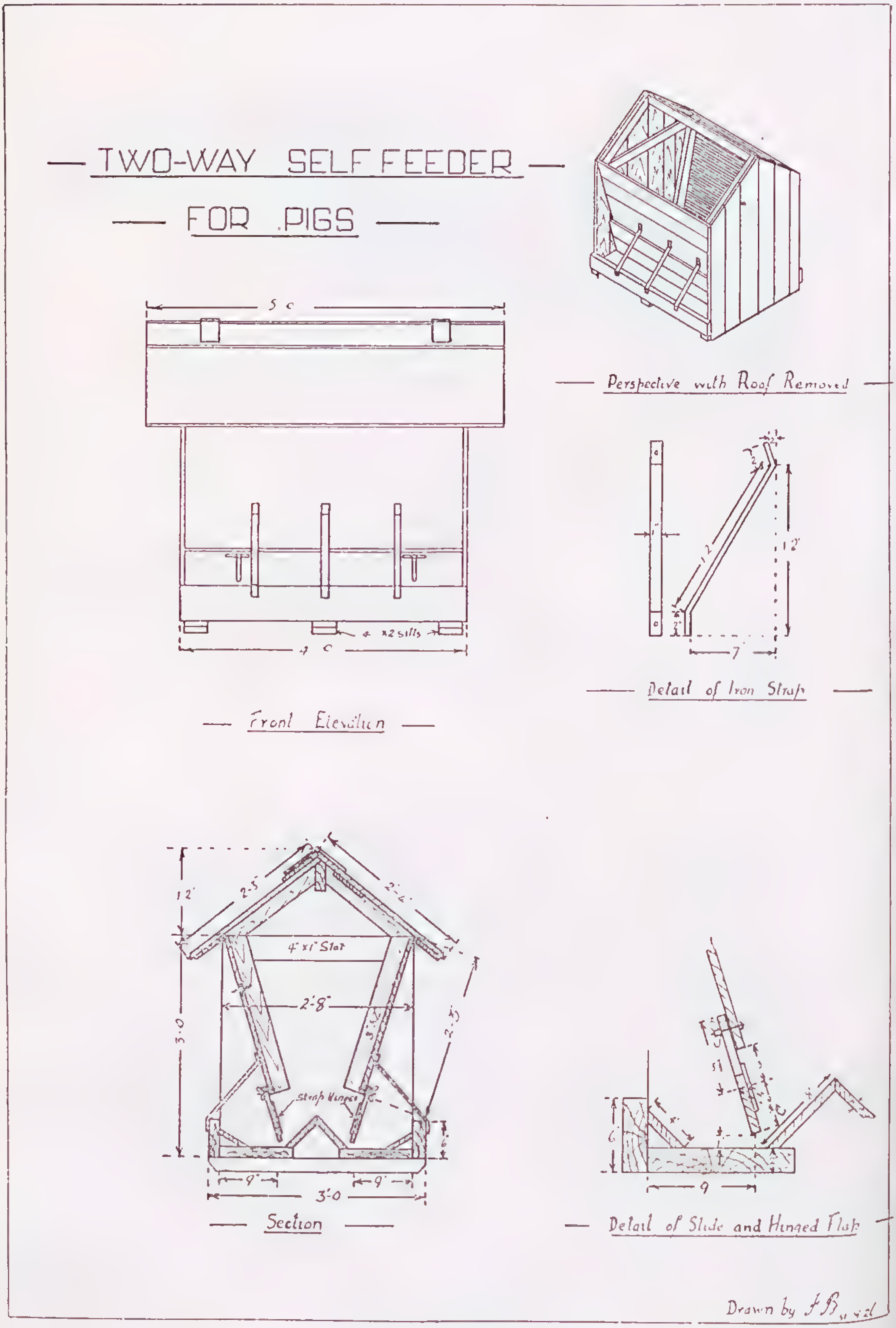


PLATE 36 (Fig. 33).

ONE-WAY SELF-FEEDER FOR PIGS—MATERIAL REQUIRED.

PLATE 35 (Fig. 32).

Members.	Number.	Length.	Size.	Material.
Skids	Three ..	1 ft 6 in.	4 in. x 2 in.	Hardwood
Trough	One ..	4 ft. ..	6 in. x 2 in.	Pine
Trough	One ..	3 ft 10½in.	12 in. x 2 in. ..	Pine
Trough	One ..	3 ft. 10½in.	4 in. x 2 in.	Pine
Trough	One ..	3 ft. 10½in.	8 in. x ¾ in.	Pine
Trough	One ..	3 ft. 10½in.	4 in. x ¾ in.	Pine
Front Panels	Five ..	3 ft. 10½in.	6 in. x ¾ in., T. & G.	Pine
Front Panels	Two ..	2 ft. 3 in.	3 in. x 2 in.	Pine
Sliding and Hinged Flaps	Two ..	3 ft. 10½in.	4 in. x ¾ in.	Pine
Ends and Back	Twenty-four	3 ft. 3 in.	6 in. x ¾ in., T. & G.	Pine
Ends and Back	One ..	7 ft. ..	6 in. x ¾ in.	Pine
Top	Ten ..	2 ft. 4 in	6 in x ¾ in., T. & G.	Pine
Top	Two ..	5 ft. ..	6 in. x ¾ in.	Pine

Hardware.

Three 1-inch by ¼-inch iron straps.

Six 3-inch strap hinges.

Two 3-inch by ½-inch bolts with thumb nuts

Nails, &c.

TWO-WAY SELF-FEEDER FOR PIGS.—MATERIAL REQUIRED.

PLATE 36 (Fig. 33)

Members.	Number.	Length.	Size.	Material.
Skids	Three ..	3 ft. ..	4 in. x 2 in.	Hardwood
Trough	Two ..	4 ft. ..	6 in. x 2 in.	Pine
Trough	Two ..	3 ft. 10½in.	12 in. x 2 in. ..	Pine
Trough	Two ..	3 ft. 10½in.	8 in. x ¾ in	Pine
Trough	Two ..	3 ft 10½ in.	4 in. x ¾ in.	Pine
Panels	Ten ..	3 ft. 10½in.	6 in. x ¾ in., T. & G.	Pine
Panels	Four ..	2 ft. 3 in.	3 in. x 2 in.	Pine
Sliding and Hinged Flap	Four ..	3 ft. 10½in.	4 in. x ¾ in.	Pine
Ends	Twelve ..	4 ft. 2 in.	6 in. x ¾ in., T. & G.	Pine
Frame of Roof	One ..	4 ft. ..	6 in. x 2 in.	Pine
Frame of Roof	Four ..	1 ft. 9 in.	3 in. x 2 in.	Pine
Frame of Roof	Two ..	2 ft. ..	4 in. x 1 in.	Pine
Roof	Twenty ..	2 ft. 4 in.	6 in. x ¾ in., T. & G.	Pine
Roof	Four ..	5 ft. ..	6 in. x ¾ in.	Pine

Hardware.

Six 1-inch by ¼-inch iron straps.

Eight 3-inch strap hinges.

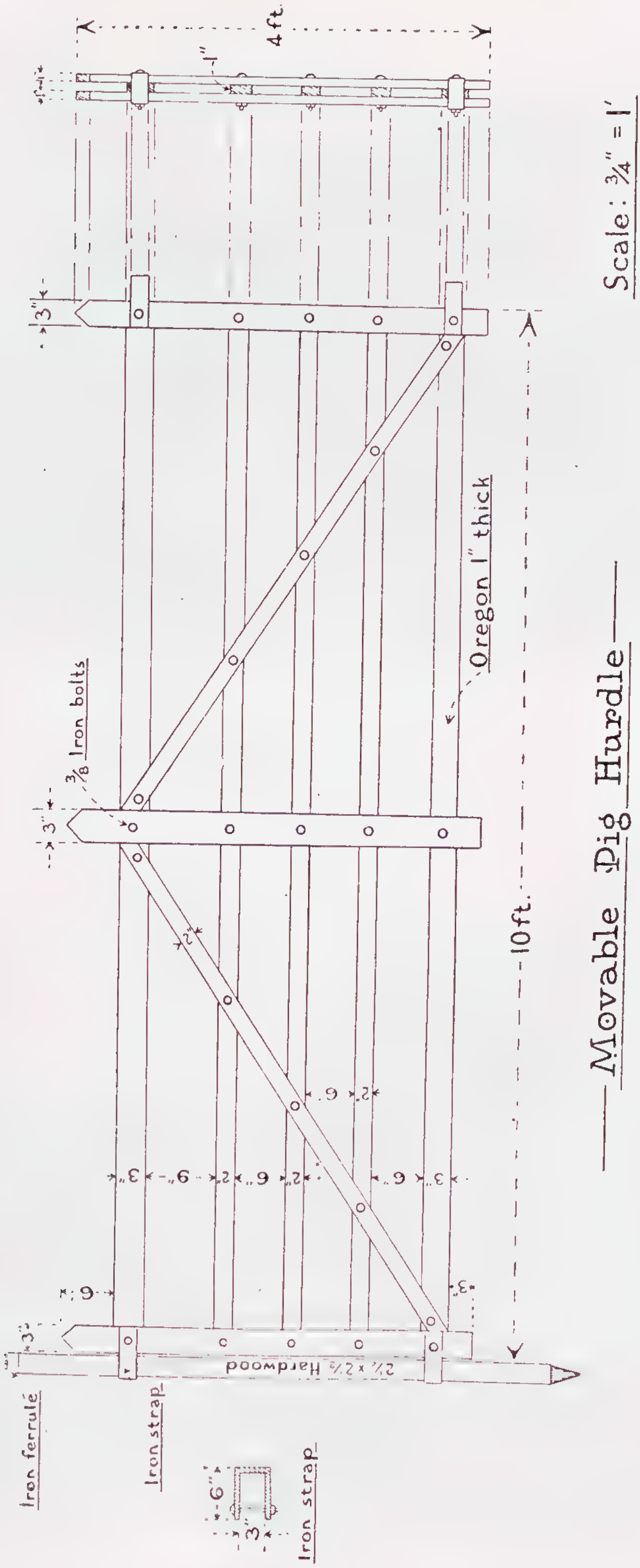
Two 5-inch strap hinges.

Four 3-inch by ½-inch bolts with thumb nuts.

Nails, &c.

PLATE 37 (Fig. 34).
Self Feeders on an American Pig Farm. Note that the feeders are placed on wooden platforms for cleanliness.

PLATE 38 (Fig. 35)
Self Feeder on Skids ready for Transport.



Movable Pig Hurdle

PLATE 39 (Fig. 36).

PLATE 40 (Fig. 37).
Berkshire Sows enjoying the shelter provided by the Budelia shrub at the Farm Home for Boys, Westbrook, *via* Toowoomba.

PLATE 41 (Fig. 38).
Shady pig yards at Hawkesbury Agricultural College, Richmond, New South Wales.

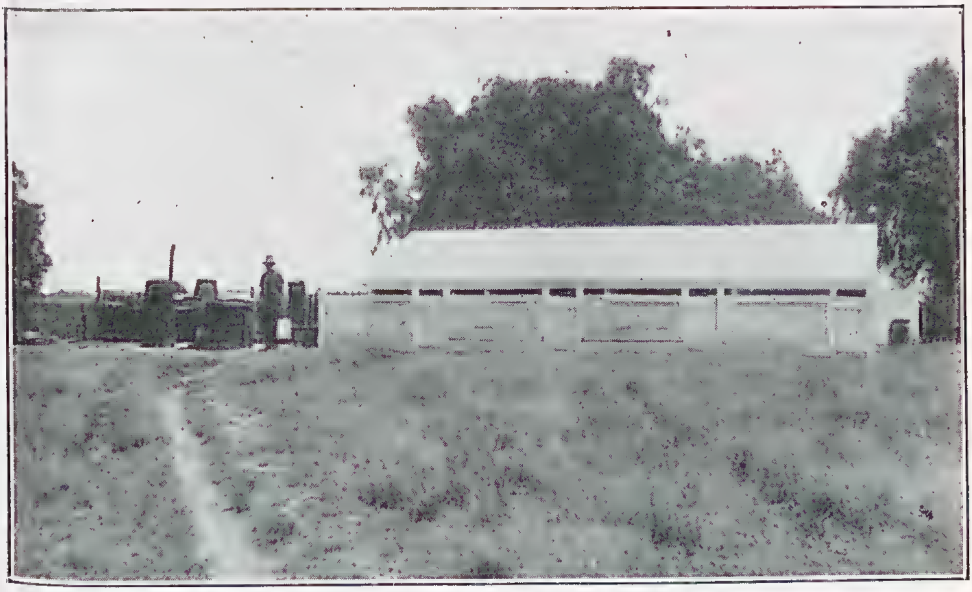


PLATE 42 (Fig. 39).
Piggery at the Dalby Sanatorium on Jimbour Plains.

PLATE 43 (Fig. 40).
Pig shed and paddock accommodation on farm of C. C. Low, North Arm, Queensland.

PLATE 44 (Fig 41).
Shed and paddock used by Walter Tully in his School Pig Club Work in the Mount Larcom District.

THE BACON PIG.

In an interesting article published in the "Journal of Agriculture," West Australia, Mr. G. K. Baron-Hay, Superintendent of Dairying, discusses in detail the position as it is in the pig industry in that State, where group settlements and other developmental schemes are in operation, and where considerable interest has been created in dairying and allied industries. That there is a very large opening in the West for enthusiastic pig farmers is clearly indicated in the statement that at present there is a local market for nearly a quarter of a million pounds worth of pork and bacon annually, the State's production last year being that much short of local requirements. There, as here, the number of pigs has fluctuated greatly from year to year, but has remained on the average constant, while the number of dairy cows has shown a continued interest. Mr. Baron-Hay indicates that this rapid fluctuation of the pig population is in itself an argument in favour of developing the pig industry, indicating as it does the capacity of the pig above all farm animals for rapid reproduction. The cow, it is stated, is only able to increase at a very slow rate in comparison, as is shown in the following table:—

	Annual Increase.
Cattle	80 to 90 per cent.
Sheep	95 to 115 " "
Pigs	1,200 to 1,800 " "

The article discussed the various problems responsible for fluctuation and for the apparent unpopularity of the pig industry, and deals in detail with fluctuation in prices of pig products, feeding stuffs, and the change of pig population from the wheat belt to the dairying districts of the State. The question of disease and its influence on the present and future position indicates that, in comparison, the pigs in the West are very healthy and that the risk of calamity should not check progress nor be other than a problem to face, for the percentage of pigs condemned for disease at the abattoirs is very light, the principal diseases being tuberculosis.

The Young Farmer.

FAT LAMB RAISING—A JUNIOR FARMER'S PROGRAMME.

Farmer Junior—the schoolboy of to-day and the wheatgrower, grazier, dairy farmer or fruitgrower of to-morrow—is an important factor in Australia's future, and it was a recognition of this that led to the institution of the Junior Farmers' Clubs of New South Wales, a movement that is also being fostered in Queensland. The club movement in the South commenced active operations about two years ago under the directions of a central council representative of interested departments and organisations, and with the good wishes of all concerned with the well-being of primary production.

That the movement is accomplishing valuable work there is no doubt. Some indication of its practical usefulness was afforded to those who attended the recent conference of the southern branches of the Agricultural Bureau at Albury, at which a special Junior Farmers' session was arranged. The chair was taken by Dudley Scholz, the president of the local club, and three papers were read by members. That the quality of these contributions was of a high standard the following extract, the concluding portion of Gordon Padman's paper on the subject of fat lamb raising, indicates. His plan to rear fat lambs would be:—

To use suitable rams—say Southdown or Suffolk.

To use the right type of ewe—big-bodied comeback or fine cross.

To have if possible flat country, hilly country, and cultivation.

To keep my ewes, before lambing, on the hilly country as much as possible, where they would not get too fat and would have to walk about a good deal.

To have good feed ready, by cultivation or otherwise, for the ewes when rearing their lambs, and to move them on to this good feed just before lambing so that they would have a good supply of milk for the young lambs.

To have all my paddocks of such a size as to enable the sheep to be moved from paddock to paddock frequently, thus keeping the grass short and fresh, and avoiding rank growth, which does not suit sheep.

To use my cultivation paddocks to grow green feed, and so make sure that my lambs would have plenty and would not be checked in growth.

To see that I got my lambs the right time of the year.

To make sure that my lambs would be offered for sale in a well-grown and prime condition, for I have noticed that good prime stock always brings good prices, while stock that is not good and prime sometimes has to be sold at prices that do not pay.

Finally, to see that the ewes and lambs were well supplied with a good salt lick.

Many much older farmers could not have outlined as sound a programme!

POINTS FOR PIG CLUB MEMBERS.

In an informative address recently on matters of interest to junior farmers and particularly to members of School Pig Clubs, Mr. E. J. Shelton, H.D.A., Senior Instructor in Pig Raising in the Department of Agriculture and Stock, Brisbane, stressed the fact that the Home Project scheme and all schemes of practical training for junior farmers aimed not only at creating additional interest and giving club members something special to think about, but aimed at emphasising the value of the open air system of stock raising nowadays so popular in every part of Australia. Stock should be kept out in the open as much as possible, he said, and we should strictly avoid keeping pigs in small, dark, and damp pens, or in enclosures where they had no opportunity for exercise or grazing on succulent pastures. Pigs were kept for profit making and for nothing else, and unless the system under which they were kept resulted in profit, the business was not worth while and should be left alone.

The pig had for generations borne the good name of being a rent-payer and a profit maker, and had been spoken of as "the hog that made Chicago," the "housewife's most wholesome sink," the "husbandman's best scavenger," and so on. The scheme aimed also at teaching lessons in co-operation, thus in combined clubs or in district clubs all that was best in the scheme and in the members was brought out. The club scheme had already been responsible for several very useful off-shoots, of which the Farm Boys' Camps at leading State Royal and Royal National Shows was a special feature. It was hoped in days to come that special schools of instruction would be held, at which club members would attend as representatives of their own schools and districts. To these outdoor schemes there must be added the advantage of indoor study and the development of an inquiring mind.

Every club member should have the ambition to be the best it is possible to be and to excel, no matter what the course of work undertaken.

We must be progressive in order to become proficient and efficient. The 4H Club motto of America was well worth bearing in mind. The four H's—

The Head to Plan.

The Hands to Carry out the work.

The Health to continue on with such progressive work, and

The Heart to stand up to both the success and disappointments associated with life on the land.

To be successful we must work hard, think hard, aim high, and hit high.

A scheme for the formation of senior clubs for boys and girls who had already left school should be quite possible, and could be organised in co-operation with the junior clubs already in operation. Pig club members are already eligible to attend the Schools of Instruction arranged at Agricultural Colleges, and recently a club member from the Gilston State School, Queensland, attended the School of Instruction to Pig Farmers held at Gatton College.

Items well worth consideration and productive of a good material for discussions at club meetings included the productive powers of farm stock, the profit there was in pig raising, the beneficial results of co-operation, the suitability of the district for agricultural operations, the value of hygiene, the extension of operations, lessons on feeding and care of animals, and so on.

There can be no doubt but that pig raising is a very profitable and lucrative undertaking, but it is well worth while discussing the disadvantages or drawbacks just as well as the advantages and profits.

There are many useful and informative pamphlets on agricultural subjects available for free distribution at the Agricultural Department in the several States, and school committees and club members should aim at securing and studying copies of these.

PARTS OF A COW.

Contributed by CHAS. F. MCGRATH, Supervisor of Dairying.

The following diagram illuustrates the various parts of a cow. It is necessary that you should make yourself thoroughly conversant with the names of the various parts before learning how to judge dairy cattle.

There are only two parts which require any explanation, viz., milk veins and the escutcheon.

Milk Veins.

The milk veins can be noticed and felt on and extending from the front of the udder along the underside of the body towards the forelegs. Of course these veins do not carry milk. The glands in the udder convert part of the blood into milk and so it follows that a large milk supply from a cow generally shows that it has a large blood supply, which in turn indicates that it must have large arteries and veins to carry that blood supply.

The milk veins carry the blood back to the heart and then to the lungs for purification. Where these veins enter the body will be found fairly large openings which are known as milk wells, which vary in size according to the size of the milk veins. Consequently, large tortuous and branching milk veins leading to large open milk wells are generally regarded as good points in a dairy cow.

Escutcheon.

This term, when applied to cattle, refers to the skin on the back portion of the cow extending upwards from the udder, on which the hair grows in an ascending instead of a descending direction.

The area and shape of the skin on which the hair grows in an ascending direction varies with different cows, and it was discovered by a Frenchman named Guenon that invariably different styles of escutcheons indicated the milk-producing capacity of the cow. Names have been given to these different styles, but as they are numerous it is not proposed to enumerate them here. Sometimes in the escutcheon small portions of the hair turn downwards. These are termed "feathers" although the term is used to cover any variation in the hair on or about the escutcheon. These feathers are of different shapes and are found in different positions on the escutcheon.

As a general rule the presence of "feathers" is not regarded as a good sign.

The escutcheon should be large and well defined.

1 Forehead
2 Horns
3 Eyes
4 Face
5 Muzzle
6 Ears
7 Neck
8 Chest
8a Brisket
9 Withers
10 Shoulders
11 Forelegs
12 Backbone
13 Barrel or Body
14 Heart Girth
15 Belly
16 Loin
17 Hips
18 Pelvic Arch
19 Rump
20 Pinbone
21 Tail
22 Thigh
23 Hind Legs
24 Fore Udder
25 Hind Udder
26 Teats
27 Milk Veins
28 Escutcheon

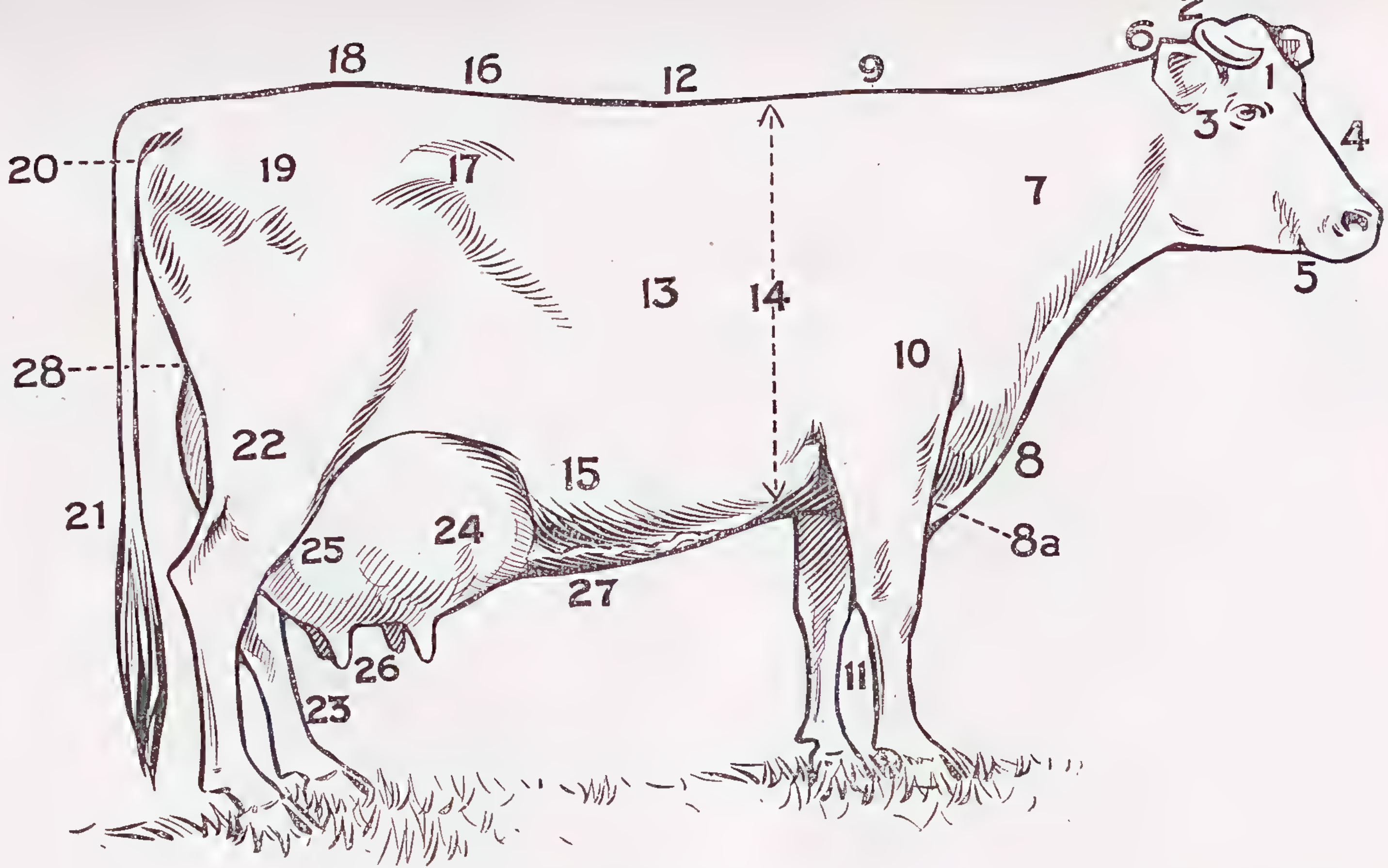


PLATE 45.—STANDARD MODEL DAIRY COW.

POINTS OF A TYPICAL DAIRY COW.

(Irrespective of Breed.)

FOR THE USE OF JUVENILE CLUBS.

Scale of Points.	Maximum Points.		Judge's Points.
General Appearance.			
Constitutional Vigour: As shown by heart room, apparent health, strength, activity and general appearance ..	5		
Form: Wedge-shaped, as viewed from front, side and top (additional to points given in detailed section) ..	3		
Quality: Hair fine and skin soft, medium thickness, loose, mellow, and unctuous with yellow secretion	6	19	
Temperament: Active and nervous (but not "wild"), indicated by movement, eyes and lean appearance ..	2		
Colour	3		
Head, Neck, and Throat.			
Forehead: Broad and full			
Horns: Fine and of medium size			
Eyes: Large, bright, and yet placid			
Face: Lean, medium length, straight or slightly dished..		8	
Muzzle: Clean and strong, mouth and nostrils large ..			
Ears: Medium size, fine in texture, yellow pigment inside			
Neck: Rather long and thin, fine, clean throat and dewlap			
Fore-quarters.			
Chest: Broad and deep			
Brisket: Lean and not fleshy			
Withers: Well defined, and not coarse at point of shoulders		5	
Shoulders: Light, sloping, not too fleshy and oblique ..			
Legs: Straight, rather short, and not too large or coarse..			
Body.			
Backbone: Well-defined, lean, open-jointed and level ..	3		
Barrel or Body: Long and large, ribs broad, well arched, open, and set wide at finish; a large strong body in proportion to size		21	
Heart Girth: Large and deep, abundant room for active heart and lungs	18		
Belly: Large, broad and deep, with a large and strong navel			
Loin: Broad and strong			
Hind-quarters.			
Hips: Wide apart, lean and refined			
Pelvic Arch: Prominent and strong	6		
Rump: Long and wide, with pin bones wide apart and well defined			
Tail: Long, fine, with good switch and neatly set on ..	2	16	
Thighs: Long and lean, flat inside and out, no beefiness, thin arched flanks			
Legs: Rather short, wide apart and not coarse; placed squarely under the body	8		
Udder.			
Fore Udder: Full, broad and extending well forward, not fleshy			
Hind Udder: Broad, full and attached high, not fleshy; plenty of loose skin; with a silky touch, without pronounced quartering	18		
Teats: Of good size and form, evenly placed, and hanging perpendicularly, texture soft	5	31	
Milk Veins: Upon the udder and in front of it, prominent, large and tortuous, leading to large open milk wells ..	5		
Escutcheon: Good of its kind	3		
Grand Total	100		

RECOGNISED COLOURS FOR HERD BOOK REGISTRATION.

I.M. Shorthorns.

Red (dark and light), red and white, roan, roan and white, strawberry roan, strawberry roan and white, and white.

Note.—Muzzle must be free from smuttiness, udder should not be quartered.

Teats should be brown in colour.

Jersey.

Whole colour varying from fawn to almost black with orange markings on the back and middle piece, or broken colours.

Note.—Muzzle should be encircled by a light colour. Horns should be small and incurving. Yellow colour on horns, escutcheon and inside of ears indicating richness.

Clipped or shaved animals not recommended.

Ayrshire.

Red of any shade, brown or white, or a mixture of each colour being distinctly defined.

Note.—Long horns generally characterise the breed.

Friesian.

Black and white patches, each colour being distinctly defined. The following colours are not allowed and would bar registration in the Herd Book:—

(1) All black or all white or red and white.
(2) Black switch.
(3) Solid black with white on belly only.
(4) Black on legs, beginning at feet and extending to knees and hocks, or with white generally prevailing.
(5) Grey or mixed black and white, generally interspersed.
(6) Patches of colours other than black and white.

Guernsey.

Light yellow, brown, or fawn, with a flesh coloured muzzle, and with patches of white.

Note.—The horns turn upwards while the face is not "dished" like the Jersey.

HOW TO JUDGE DAIRY CATTLE.

In judging a dairy cow the first essential is to view the general outline of cow. This can be best done from a distance of ten or fifteen yards.

Side View.

The cow should be "close to the ground"—that is, its body should be fairly low and not "leggy."

The body should be wedge-shaped—that is, deep at the hind legs and narrower towards the fore legs.

Front and Back View.

When viewed from the front the wedge shape should be apparent. The well-sprung rib should contrast with the comparatively narrow forepart. A close inspection of the animal should now be made.

Udder.

If the cow is in full milk the udder, viewed from the back, should be wide and run well up towards the tail. Feel the udder. It should be elastic—soft and silky with an oily feel.

The udder, viewed from the side, should run well out under the belly and be held up close to the body for preference. Teats should be of medium length and not bottle shaped. They should be spaced evenly on the udder and should be of a dark colour for preference.

Milk Veins.

Run your hand along them. They should be large, and tortuous and extend well forward.

Skin.

The skin should be felt behind the last rib. It should be soft and elastic. A thick hard skin is a bad sign.

Escutcheon.

This should be of a comparatively large area.

Head.

The cow should have a good breadth between the horns, a well carved head, full, bright eyes, well developed nostrils, and a strong mouth with even jaws (not pig-jawed).

Neck.

The neck should be of good length, fine about the shoulder, and not baggy about the throat.

Back.

The back should be level from neck to tail, the backbone being well defined.

Tail.

The tail should drop perpendicularly and should be of good length, ending in a good brush. A short thick tail is a bad feature.

Hindquarters.

Should continue wide back to the pin bones. The thighs should be long and flat inside and outside, and from a side view should curve slightly forward.

PLATE 46.—A PIG CLUB CLASS AT CLOYNA.

The Instructor, Mr. Shelton, of the Department of Agriculture and Stock, is about to demonstrate on a porker prepared for the purpose. The nature and functions of the pig's "innards," their condition of health, and other pathological points will be explained to the young farmers while their elders, quite as keen, look on.

PLATE 47.—JUNIOR FRUIT PACKERS PLEASED WITH THEIR JOB.

In conjunction with the Department of Public Instruction the Department of Agriculture and Stock conducts fruit packing classes for school children. This picture was taken at Thornlands on the orchard of Mr. A. F. Smith, who supplied the fruit and other facilities for the success of the class. Each lesson lasts an hour, and these cases were packed by the young farmers in their second lesson. The children, under the leadership of their head teacher, Mr. Fraser, display great eagerness and keen intelligence in their club work.

PIG CONFERENCE IN THE WEST.

To invite discussion of the various problems and to get together to discuss the position, the West Australian Minister for Agriculture recently called a conference of parties interested, including representatives of the factory organisations, the distributors, the producers, and departmental officers. As a result, certain definite decisions were arrived at, and it was unanimously agreed that the type, conformation, and general quality of carcasses which meet the requirements of the bacon curers also meet those of the pork trade, and vice versâ. This discussion is of outstanding importance, as it is often assumed that different breeds or crosses are required to produce animals best suited to the pork and bacon markets respectively. A standard was set up for carcasses for pork or bacon in West Australia to which attention of all pig raisers is to be directed.

The type of carcass required in West Australia does not materially differ from that required in the Eastern States of Australia, but it is of interest to know that a definite breeding policy has been decided upon, and it has been unanimously agreed that for West Australia conditions a combination of the Berkshire and Tamworth breeds yielded the best bacon pig and also an excellent porker. The ideal pig would be obtained by the production of the breeding sow from mating purebred Berkshires with purebred Tamworths and mating the sows from the cross-breed to a purebred (unrelated) Berkshire boar. This is known as the "Berkshire-Tamworth comeback."

In grade herds of various breeds the purebred selected Berkshire boar is recommended for grading up and the production of bacon pigs. In order to produce standardisation within the pig industry, great importance is attached to the selection by the farmer of a suitable breed or cross, which principle is considered the foundation of the trade. The above recommendation has been based on purely commercial considerations; and concentration on two breeds or crosses, which supply the demands of the market, is undoubtedly preferable to diversity.

Answers to Correspondents.

BOTANY.

The following answers have been selected from the outgoing mail of the Government Botanist, Mr. C. T. White, F.L.S.:—

Broad-leaf Carpet Grass.

H.H. (Landsborough)—

Your specimen is *Paspalum platycaule*, the Broad-leaf Carpet Grass, a native of tropical America now widely spread over the tropical and sub-tropical parts of the world. It is very abundant in North Queensland, and of late years has come further south and is now quite common along several places on the North Coast Line between here and Gympie. It is not generally regarded as of a particularly high fodder value, but is useful for growing in poorer lands where ordinary paspalum will not thrive. A rather better strain from a fodder point of view is the narrow-leaf form sold in Australia under the name of *Axonopus compressus*.

Hare's Ear Mustard.

J. H. McC. (Dalby)—

The specimen is Hare's Ear Mustard, *Conringia orientalis*, a very common European and American weed now found naturalised throughout the more temperate parts of the world. It belongs to the Mustard or Cabbage family and the local name arose from the shape of the leaves being somewhat like that of a rabbit's ear. Beyond being a weed in cultivation it is not known to possess any harmful qualities.

Scrub Panicum.

A.J.G. (Duleen)—

The specimen is *Setaria macrostachya*, a native grass generally known as Scrub Panicum. It is not particularly common in any one locality, though it is fairly widely spread over Queensland, and is generally regarded as a rather coarse fodder. It is easily propagated from seeds, but it is not so succulent and has no particular advantage over other species of Setaria commonly cultivated under the name of Panicum, Hungarian Millet, &c.

Jack Bean *(Canavalia ensiformis)*.

N.D. (Beaudesert)—

The bean is a species of Canavalia, but these are rather hard to tell in the young stage. It is, however, we should say, *Canavalia ensiformis*, the Jack Bean, characterised by having large white seeds.

The bean may be used sliced as much in the same way as ordinary French beans in the young stage, or the nearly ripened seeds can be boiled and eaten in the same way as ordinary broad beans. It is as well to be cautious when using them as they do not agree with all stomachs, though we have used them at various times and found them quite good eating.

Another variety, *Canavalia gladiata*, is commonly grown here. It has large red seeds and is not generally considered so good as the white-seeded variety.

Buffel Grass.

M.A.V.B. (Alice Springs, Central Australia)—

The specimen is *Pennisetum cenchroides*, the Buffel Grass. We are very interested to learn that the grass is growing in Central Australia, as the only other place we knew of it growing in Australia in any quantity at all is in the north-western parts of Western Australia, where it was introduced from India about fifteen years ago. The manager of Dalgety's branch at Port Headland stated that it makes a tender sweet growth liked by all classes of stock, and in addition makes excellent hay, and in a good season grows from 18 to 24 inches high. Thinking the seeds might be injurious to wool we got in touch with Mr. MacKenzie, of Dalgety's, at

Port Headland branch, and he replied as follows:—"It is quite harmless to wool. It thrives here in purely cattle and sheep country, and does not affect the wool in any way."

The grass has, we understand, within the last couple of years been introduced into one or two places in Queensland, but we have not seen it growing here as yet.

Red Clover. Bougainvillea.

W.A.E.C. (Tamaree)—

Your specimen is Red Clover, *Trifolium pratense*. This is very interesting, as the Red Clover is not generally regarded as suitable for Queensland conditions, as it is inclined to die out with our hot summer weather.

Bougainvilleas.—There are several coloured variations, and the following are the best four now generally listed by nurserymen:—

Bougainvillea glabra var. *Sanderiana* or *Bougainvillea Sanderiana*, magenta coloured; *Bougainvillea lateritia*, the brick-red Bougainvillea; *Bougainvillea magnifica*, a bright purple of which a variety, var. *Araillii*, is listed as an improved form; and *Bougainvillea rosea* (also known as *Bougainvillea Thomasi*), deep pink. This last is generally regarded as one of the best, and plants are a little more expensive than the other varieties. The best time for planting is either spring or early summer.

Rattle Pod *(Crotalaria incana)*.

J.C.H. (Jackson)—

The specimen, taken from an old cotton patch, is *Crotalaria incana*, a species of Rattle Pod. The genus Crotalaria is a large one, widely spread over the warmer parts of the world, the species being generally known as Rattle Pods or Rattle Boxes due to the rattling noise the seeds make in the dry pods. They are generally regarded as poisonous or harmful to stock and, mostly, stock avoid them. The plant you forward has come under suspicion at various times, though nothing definite has been proved against it. In view, however, of the poisonous nature of other members of the same group of plants it is as well to destroy it from paddocks where it makes its appearance.

Fuchsia Bush.

J. H. McC (Dalby)—

The specimen of fuchsia bush from the Dalby district represents *Eremophila maculata*. The specimen was also handed to the Agricultural Chemist, Mr. J. C. Brünnich, and the following is a copy of his analysis:—

—		Lab. No. 2792, Fuchsia Bush.	Lab. No. 2996, Fuchsia Bush.
		Per cent.	Per cent.
Moisture		8·4	12·1
Analysis of Waterfree Material	Protein	18·0	12·4
	Carbohydrates	56·4	46·1
	Fat	0·7	1·1
	Fibre	14·4	32·4
	Ash	10·5	8·0
	Lime	1·491	·943
	Phosphoric Acid	·544	·216

The first sample had a very fair fodder value, but the second sample is very poor for a shrub and very indigestible on account of high fibre content. It is quite possible that this plant has a severe effect on worms, as it is highly poisonous, and according to latest researches a little less than 1 oz. of the air-dried leaves will kill a sheep in about forty minutes. It would be a great mistake to rely on this plant as a worm remedy, and it should be eradicated wherever found to avoid disastrous results, which might happen at any time.

PIG RAISING.

Replies selected from the outward mail of the Senior Instructor in Pig Raising, Mr. E. J. Shelton, H.D.A.:—

Cotton Seed a Risky Pig Food.

N.D.M. (Coominya)—

The Agricultural Chemist, Mr. J. C. Brünnich, states that the feeding of cotton seed to pigs is always risky, and that it is not a suitable food for breeding sows. As you have some separated milk and lucerne available, we would recommend maize grain and meat meal to complete the ration. With plenty of milk and lucerne you only require maize to balance the ration, but when skim milk is scarce the addition of meat meal will make up for the protein matter which is usually supplied in the milk. Lucerne should be used as fully as possible both as grazing and by adding lucerne chaff or dust to the skim milk. When milk is not available, the pigs will do well if grazed on lucerne and fed a ration made up of maize 80 lb., meat meal 10 lb., and lucerne dust or good leafy chaff 10 lb. If milk is used the meat meal can be reduced to about 3 lb. in every 100 lb.

Housing the Breeding Sow.

A beginner in the pig business recently asked a number of important questions having reference to his desire to gain up-to-date knowledge in regard to a number of details on which it was apparent there was a diversity of opinion. Among other queries the following were submitted:—

Question.—Would it be necessary to provide both sleeping and farrowing sties? I am told it is better to allow the sows to go away into the bush and farrow on their own and bring the young ones home when they are ready.

Answer.—The provision of suitable housing both for farrowing sows and for other pigs is strongly recommended. It is not argued that a sow that farrows in the bush will not produce a good litter; but on the average, the losses are about 50 per cent. higher than where the sows are properly cared for in sties. The pig sties need not be expensive buildings nor need they be elaborate, but sties are an absolute necessity just as are fences and feeding troughs. With regard to the number of sties that are required for fifty sows, at least twenty sties arranged for farrowing should be provided. Portable shelter sheds that can be moved from place to place in the paddocks where the pigs graze can be used for housing the paddock pigs. The central farrowing house is a necessity on a pig farm where there are sufficient sows to warrant the expense. This farrowing house would be a series of up to twenty or more pens adjacent to one another, and it is thought for preference, if the ground available permits, it is better to arrange these under one roof with a central passage-way and feeding troughs on either side, the pens to be approximately 10 feet wide by 8 feet deep, or at outside, 10 by 10, with feeding troughs in the same compartment as the sleeping floor if the style of building decided on permits of this. This would necessitate concrete or brick and cement floors both for the feeding area and the sleeping place, the latter to have a hardwood floor affixed on top of the concrete to obviate the necessity for the sow sleeping on the stone floor, the latter being objectionable and liable to lead to trouble from rheumatism.

It is admitted opinions vary on these questions, for some breeders prefer to have a long straight line of pens with the sleeping accommodation under cover at the back of the pens, and the front portion open (but securely fenced) to permit of the feeding trough being in the open exposed to sunlight, the feeding to be done either through a spout in the end of the trough which would project slightly beyond the sty, or by means of a swing-door opening into the trough. In both cases it is a decided advantage, even a necessity, to have good exercise yards attached to each sty so that the pigs can live out as much as is possible while compelled to remain in confinement with their young litters. In both systems a set of rails and a feeding trolley would be an advantage, and where the number of pigs to be fed warrants this it should be attended to. If this is not possible a feeding barrow of sufficient size to carry the feed required should be provided, or a less expensive arrangement—a barrel or two on a slide drawn by a horse, would suffice. The sow and litter should be transferred to the open runs again after the boar pigs are castrated (at six weeks of age) and the litter is approaching weaning age, but, if possible, no more than one or two sows and litters should feed together, as it is a mistake to have a number of sows and litters running in the one yard.

Under the American system the sows are kept in yards or small paddocks up to one-quarter of an acre or less in size, and each yard has an individual farrowing house which acts as sleeping quarters. The feeding troughs are then placed right away from the house, and the feed is carried by slide and barrel or by some other system of a labour-saving nature.

It is, generally speaking, a mistake to allow sows to go away into the bush and farrow without any attention at all, though even under this system some breeders report successful results. The housing of the breeding sow is a subject worth the closest study.

Costs in Pig Raising.

Question.—When growing pig feed, does one deduct from the price of the pigs sold, the market value of the food produced, or only the actual cost of producing the food; that is, if it costs me 2s. 6d. to produce one bushel of corn, and corn was worth 4s. 6d. per bushel, would I deduct 4s. 6d. from the price of my sale pigs or only 2s. 6d.?

Answer.—To ascertain the actual profit resulting from the sale of any line of pigs, one must not only deduct the cost of food, but also of labour, cartage, and incidental charges generally. It is usual to deduct the actual value of the food produced only. Of course, by actual value in this case is meant the value of the crop, as it is in the form in which it is fed to the pigs. Take corn, for instance. Corn-growing or ripening in the paddock cannot possibly be valued at the same price as that which is sold in the market; it costs something in the first instance to plough the ground, harrow, drill, sow, cultivate, and produce the crop to the stage at which it is ready for pulling. Then it costs someing more to pull the corn, husk and shell it, clean, bag, and place it on the market; the latter charge will be proportionately higher than the former; hence, in charging up the value of the corn as a pig food you would value it at its actual cost to you on the farm. It is difficult to say how much a bushel of corn costs to produce, but it certainly is not worth 4s. 6d. per bushel (or its market value) until it is in the bags and on the market. It would not be fair to charge up the cost of the corn to the pigs at the market price you receive for it after you have gone to the expense of husking, shelling, cleaning, bagging, carting, railing, or shipping, and selling it at auction in the market. The pigs can do the husking, shelling, &c. The same may be said of any other crop; you would charge up its actual value on the farm, not its value on the city or other markets.

The whole question of costs of production is an important one, and one that needs very close attention if the farmer is to work on anything like up-to-date lines. The old rule-of-thumb methods do not pass nowadays, for we must keep some records or we cannot correctly make the allowable deductions in making up our income tax papers, or in giving details of cost of production. It is a good idea to keep a record of the market value of any foods used and to endeavour to figure out the additional profit resultant from utilisation on the farm of the crop or foods produced thereon. The farmer is not however usually inclined in the direction of accountancy, but it adds considerable interest to the business if we know exactly or approximately how we stand financially.

Arsenic Pentoxide as a Spray. Grenadilla. Banana Suckers.

V.T. (Djarowong, Feluga, N.Q.)—

1. *Spraying of Grass with Arsenic Pentoxide.*—The Director of Agriculture advises that a test of this character has not been carried out. However, as this chemical is a very potent plant poison it may have an effect on partly matured seed. The better plan would be to burn off the dried grass after it has been sprayed. Another substance suitable for weed and grass destruction is Sodium Chlorate. Information on and supplies of the poison may be had on application to A. C. F. and Shirleys Fertilisers Ltd., Little Roma street, Brisbane.
2. The Agricultural Chemist, Mr. J. C. Brünnich, advises that nothing is known about the vitamine content of the grenadilla. Like all fruits, it is bound to contain some.
3. The Director of Fruit Culture, Mr. Geo. Williams, advises that a banana sucker cut close back should have the centre "scored" out and a shoot allowed to develop from the side. It will then throw a better bunch than if not cut back at all.

General Notes.

Staff Changes and Appointments.

Messrs. F. C. Robinson and R. A. Ulcoq, of Gayndah, have been appointed Honorary Inspectors under and for the purposes of "*The Diseases in Plants Act of* 1929."

The Officer in Charge of Police at Cardwell has been appointed an Acting Inspector of Stock and also an Inspector of Brands.

Mr. C. Mitchell, Health Inspector, Townsville, and Mr. W. Austin, Health Inspector, Mackay, have been appointed Inspectors under and for the purposes of "*The Dairy Produce Act of* 1920."

Mr. W. Cottrell-Dormer has been appointed Assistant Pathologist, Bureau of Sugar Experiment Stations, Department of Agriculture and Stock, as from 1st April, 1930.

The services of Mr. P. J. Short, Temporary Inspector of Slaughter-houses, Warwick, have been continued from 1st May to 30th June, 1930; and the services of Mr. F. C. Shaw, Temporary Inspector of Slaughter-houses, Cairns, have been continued from 18th May to 14th June, 1930.

The appointment of Acting Sergeant D. J. Gavin as Acting Inspector of Stock has been cancelled, and, in lieu, the Officer in Charge of Police at Bell has been appointed an Acting Inspector of Stock. Mr. E. C. Dunn, Inspector of Stock, Kingaroy, has been appointed also an Inspector of Brands; and the services of Mr. F. C. Shaw, Temporary Inspector of Slaughter-houses, Cairns, have been continued from 15th to 30th June, 1930.

The following have been appointed cane testers for the forthcoming sugar season at the mills mentioned in each case:—Miss D. Marles (Babinda), Mr. T. P. Brown (Bingera), J. G. D. Casey (Cattle Creek), T. D. Cullen (Fairymead), Miss F. Parkinson (Farleigh), Miss E. Christsen (Gin Gin), G. R. Jorgensen (Inkerman), Miss M. T. Smith (Invicta), Miss J. O'Flynn (Isis), W. Ahern (Kalamia), W. Richardson (Marian), Miss A. L. Levy (Maryborough), C. J. Boast (Millaquin), Miss I. Palmer (Moreton), V. F. Worthington (Mossman), F. H. Compton (Mount Bauple), Miss N. Walsh (Mourilyan), H. Jensen (Mulgrave), Miss J. Orr (North Eton), T. Breen (Pioneer), L. G. F. Helbach (Plane Creek), W. J. Mason (Pleystowe), L. Chadwick (Proserpine), Mrs. K. Dunton (Qunaba), L. G. Home (Racecourse), J. Howard (Rocky Point), T. Herbert (South Johnstone), and F. Jorss (Tully).

The following have been appointed assistant cane testers for the forthcoming sugar season at the mills mentioned:—Miss A. Mullin (Babinda), Miss M. A. Morris (Bingera), G. Tait (Farleigh), Miss G. Dingle (Inkerman), Miss C. Humphreys (Invicta), G. Fanning (Kalamia), D. Walton (Marian), Miss N. C. Whittle (Marian), Miss A. Murray (Maryborough), Miss D. Bowder (Millaquin), Miss M. A. Lyle (Moreton), Miss T. Payne (North Eton), H. Whitcher (Pioneer), Miss M. Orr (Plane Creek), Miss E. Rowe (Plane Creek), H. Humphreys (Pleystowe), Miss O. Knight (Pleystowe), Mrs. M. Nally (Proserpine), and T. F. Corbett (Tully).

The transfers of the following District Inspectors of Stock have been approved:—W. N. Holmes, from Warwick to Townsville; J. J. Ashe, from Townsville to Mareeba; and E. C. Lake, from Mareeba to Warwick. Mr. J. Gunne, Inspector of Stock, Beonah, has been transferred to Gladstone, and Mr. J. P. Dowling, Inspector of Stock, Warwick, has been transferred to Clermont. Mr. J. C. Pryde has been appointed a Temporary Inspector of Stock and Slaughter-houses at Gympie. Mr. W. O. Hynes, of Godfrey street, Toowoomba, has been appointed an officer under the Animals and Birds Acts.

The Officers in Charge of Police at the following places have been appointed Inspectors of Brands:—Biggenden, Eidsvold, Gayndah, Gin Gin, Goomeri, Howard, Imbil, Kilkivan, Kumbia, Monto, Mount Perry, Mundubbera, Murgon, Proston, Rosedale, and Tiaro.

Commodity Boards—Government Representation.

The constitutions of the Arrowroot, Cotton, Atherton Maize, Barley, Honey, Canary Seed, and Butter Boards have, till the present time, provided that those boards shall consist of a certain number of elected representatives of the growers of the particular commodity and the Director of Marketing. The constitutions of these boards have now been amended to allow of a deputy appointed by the Minister representing the Minister on the boards in case of the absence of the Director of Marketing.

Inkerman Mill—Levy Transfer.

As the result of a levy made on the Inkerman mill suppliers during 1929, in order to defray expenses in connection with the farmers loading sugar at Townsville during the Waterside Workers' strike in 1928, a balance of about £80 was left after the payment of expenses. An amendment has been approved to Regulation 210 (which gave the mill suppliers' committee power to impose the levy) whereby this balance may be transferred to the administrative fund of the committee, thus making the levies for this year for administrative purposes so much lighter.

Cheese Board.

An Order in Council has been approved giving notice of the intention of the Governor in Council to issue an Order in Council extending the operations of the Cheese Board for a period of three years as from 1st August, 1930. It is also declared that the Governor in Council will receive, on or before the thirtieth day of June, 1930, a petition signed by not less than 10 per cent. of the growers of cheese requesting that a vote of such growers be taken on the question as to whether the functions of the Cheese Board shall cease on 31st July, 1930, or continue until 31st July, 1933. Growers eligible to vote will be persons who, at any time within the six months immediately prior to the election, supplied or supply milk to cheese manufacturers in Queensland.

Entomological Branch—Mr. Veitch's Tour Abroad.

The Secretary for Agriculture (Mr. H. F. Walker) announced recently that Mr. R. Veitch, the Chief Entomologist and Vegetable Pathologist for his Department, had left by the R.M.S. "Maloja" for England.

Although Mr. Veitch is really going on a holiday tour, Mr. Walker has commissioned him to visit the chief entomological and vegetable pathological institutions in Great Britain with the object of acquiring any information that would be useful to his Department. At the same time, he would make inquiries into the possibilities of securing a suitable Pathologist who would be able to undertake the work in Queensland in connection with the disease of pineapples. This matter had recently been brought under Mr. Walker's notice by the Pineapple Sectional Group Committee.

Mr. Veitch would also inquire into the practicability of obtaining in Great Britain the services of an Entomologist who would devote his time to the entomological problems, particularly the corn ear worm, connected with cotton-growing in Queensland.

Cattle of the Future—Significant Facts.

From the Red Poll Cattle Society:—Significant facts with regard to the future of the cattle-breeding industry in most parts of the world are to be seen in the growing attention that is being bestowed in the breeding of dual-purpose stock. Evidently the warning note sounded by those in a position to judge of the future, that a beef shortage is imminent, has had not a little to do with the remarkable demand that has sprung up not only in Great Britain for dual-purpose cattle but of the widespread trade experienced for the dual-purpose Red Poll bull overseas. This British breed, which enjoys a considerable reputation for hardiness, has, in the last two years, met with its biggest export demand in its long history.

The remarkable trade for sires grows apace. While they have gone to North and South America, and have also been imported into Australia in the last twelve months, the extraordinary demand with South Africa, East Africa, and South-west Africa continues unabated. It is explainable when, according to the statement of a big ranch owner in one of the driest parts of South Africa, the Red Poll has proved a type of cattle desirable for semi-tropical countries because of its strong constitution and ability to produce butter and beef. The same farmer states that experience has shown him that the Red Poll has best served his purposes for cross breeding, and he emphasises the value of a dual-purpose breed owing to what, as he says, has proved the unwise policy of having bred for the pail, thereby leading to the production of far too many long-legged animals of poor constitution.

So far this year the exports of Red Polls have been to Kenya Colony whither a fresh contingent are on the way, Southern Rhodesia, Victoria (Australia), the Argentine, Queensland (Australia), and Brazil. The continuance of this trade for Red Polls for both pure and cross breeding, while being not a little due to the dual-purpose characteristics, is the outcome of a decided tendency for cattle breeders to have two strings to their bow, by producing milk and beef from one and the same breed.

Cotton Board.

An Order in Council has been passed amending the Primary Producers' Organisation and Marketing Acts so that now the Cotton Board shall not take cognisance of nor be compellable to pay any order given by a cotton grower to pay to any person, except the Crown or itself, any portion of the moneys due to such grower on account of seed cotton by the Board. This means that, in future, the Cotton Board need not recognise any orders given by cotton growers to tradespeople or others on account of any moneys due to them by the Cotton Board for seed cotton.

The Fruit and Vegetables Act.

The grade standards in use at present for Cavendish bananas (''Special,'' ''Choice,'' ''Standard,'' and ''Plain'') have been rescinded, and a regulation has been passed under the above Act substituting new standards therefor. These new standards are ''Sixes,'' ''Sevens,'' ''Eights,'' and ''Nines,'' and the measurements are as follows:—

Sixes—5½ to 6½ in. in length, by 4 in. in circumference;
Sevens—6½ to 7½ in. in length, by 4 in. in circumference;
Eights—7½ to 8½ in. in length, by 4¼ in. in circumference;
Nines—8½ in. and over in length, by 4¾ in. in circumference.

All measurements for length are to be taken on the outside of the curve from the junction of the fruit at the stem end to the apex of the fruit.

Returns by Honey Merchants.

Regulations 246 and 247 under the Primary Producers' Organisation and Marketing Acts have been approved. These regulations provide that, for the purpose of collecting statistics for the use of the Honey Board, all wholesale merchants for the sale of honey must furnish to the Minister, on or before the 14th June, 1930, returns in respect of the twelve months from the 1st May, 1929, to the 30th April, 1930, as follows:—

(1) The total quantity of honey (in lb.) purchased during the period, showing the quantity purchased direct from growers, quantity purchased from commission agents, and any purchases from other States, naming the States.
(2) Stock of honey on hand at 30th April, 1930, and the proportions of which are Queensland honey and Interstate honey.
(3) Stock of honey on hand at 30th April, 1929.
(4) Wholesaler to state whether he has a blending and bottling plant in use on his premises, and, if so, what type and capacity.
(5) Signature and address.

Any person who commits a breach of the above regulation shall be guilty of an offence, and be liable to a penalty not exceeding five pounds.

Farm Life—Influence of the Motor.

It is doubtful if there is any other class of the community whose life has been so much affected by the motor vehicle as the man on the land. The farmer to-day is in touch with all the advantages of urban life, without certain of the drawbacks that living in a city undoubtedly has. The cultural advantages that are made possible by massed population are open to the farmer and his family by means of motor transportation on just as easy terms as they are available for residents of the city. The isolation, which used to be a burdensome characteristic of farm life, has been removed by the introduction of the motor vehicle. but even this contribution to the pleasure of rural life is not the most important factor in the benefit given to the farmer by motor transportation.

On the practical, utilitarian side the contribution is even greater. By means of motor transport vehicles the hauling time for farm products has been cut probably to a quarter of what it used to be. This means that the farmer's labour bill to-day can be devoted principally to productive effort on the land, instead of being to a considerable part a payment for the necessary but unproductive work of carting. Where years ago a man's whole day, and perhaps many days together, was needed for carting produce to market or railway a quarter of that time now suffices and the rest is available for more productive work.

This item of hauling carries with it, of course, the benefits that have accrued to the farmer from the multiplication of good roads, which never would have come without the impetus given by the motor car.

Banana Growing in the Quarantine Area.

The Secretary for Agriculture and Stock, Mr. Harry F. Walker, announced recently that as promised at the meeting of banana growers held at Palmwoods on 12th June, he had conferred with the members of the Banana Protection Board (Messrs. K. R. Hack and A. E. Maher, representing the growers, and G. Williams, Director of Fruit Culture, and J. H. Simmonds, Plant Pathologist, Government Representatives), also Mr. W. Ranger, Manager of the Committee of Direction of Fruit Marketing, regarding the question of allowing planting in the recently proclaimed Bunchy Top Quarantine Area, and as a result of this conference it had been decided unanimously that permits in the quarantine area shall be issued subject strictly to the following restrictions, in addition to the general conditions laid down by the Board:—

1. No permit shall be granted to an applicant whose plantation at the date of application, either wholly or in part, is in a neglected condition or has at any time during the preceding six (6) months been known to be so and/or where such neglected condition has not been rectified without without pressure from an inspector.
2. No permit shall be issued in respect of any plantation in which Bunchy Top has appeared during the preceding four (4) months. Exemptions from this clause may be granted by the Board under special circumstances.
3. In general, permits shall not be issued for any area or areas which will bring the total acreage under bananas for any one owner or occupier in excess of eight (8) acres, unless by special permission of the Board.
4. Planting of new areas by persons not at present established in the district is undesirable, and permits for such planting will only be granted by the Board under very special circumstances.
5. Any plantation in which Bunchy Top is found discernible in the third leaf from the top of the plant shall be classed as a neglected plantation and dealt with as such.

Declaration of Banana Plants as a Pest in Metropolitan Fruit District.

A Proclamation has been issued proclaiming a Metropolitan Fruit District (No. 10 under the Diseases in Plants Act), and a second Proclamation has also been issued proclaiming that all plants of the Genus Nusa (including Bananas, Plantains, and Manila Hemp), but not including the fruit thereof, in such Metropolitan Fruit District, are pests under and for the purposes of "*The Diseases in Plants Act of 1929.*"

The boundaries of the Metropolitan Fruit District are defined as follows:—Commencing on the right bank of the Brisbane River at a point south from the south termination of Bunya street, Whinstanes, and bounded thence by a line and that street north to the Pinkenba Branch Railway, by that railway south-westerly to Mordant street, by that street north, by Hampden street west, by Nudgee road northerly to Blinsinger road, by that road north-westerly to Northgate road, by that road north-easterly to Tufnell road, by that road north-westerly to Downfall Creek, by that creek upwards to the Sandgate road, by that road north-westerly to Robinson road, by that road west to Railway parade, by that parade south-easterly to Geebung road, by that road south to Hamilton road, by that road west to Gympie road, by that road southerly to Stafford road, by that road westerly to South Pine road, by that road, Bell street, and Stewart road southerly to Waterworks road, by that road westerly to Orchard road, by that road, Barnett road, Simpson's road, Mount Coot-tha road, Dean street, Sherwood road, and Miskin street southerly to Stanley terrace, by that terrace westerly to Taringa parade, by that parade, Moggill road, Witton road, and Bridge street southerly and east to the Brisbane River, by the right bank of that river upwards to a point north from the northern termination of Fort road, by a line, that road, and a road in continuation south-easterly to Ipswich road, by that road and Rice street north-easterly and northerly to Hamilton road, by that road and Beaudesert, Mayfield, Toohey, Marshall, and Holland roads easterly and north-easterly to Cavendish road, by that road and Boundary road northerly to the Old Cleveland road, by that road easterly to Creek road, by that road, Murarrie, Queensport, and Lytton roads northerly to Bulimba Creek, by that creek downwards to the Brisbane River; and thence by the right bank thereof upwards to the point of commencement.

As a result of the foregoing it will now be necessary for all persons having bananas growing in the abovementioned area to take them out and destroy them. The object of the declaration is in connection with the campaign to prevent the spread of Bunchy Top in banana-growing areas. At the present time the growing of bananas in suburban gardens is a serious menace to the industry, and in the vast majority of cases these bananas serve no useful purpose.

Clothes of Australian Make.

Mention was made at the annual meeting of shareholders in Pike Brothers, Limited, Queen street, recently, of the great advance that has taken place in the making of Australian goods. Due to the company's effort to get manufacturers to make for them special quality goods, with exclusive features, it is now found necessary to import but a small percentage of stock, and that only in the really exclusive wares from world-renowned producers whose goods would ever be sought. It is estimated that about 87½ per cent. of the firm's stock is made in Australia, practically all ready-to-wear clothing; all shirts and pyjamas are made on the premises. Almost all their collars are now made in Australia, while the greater proportion of the hats, caps, underwear, boots, and leather goods are all purchased here, from those makers who were prepared to meet Pike's special demand for super-quality articles.

The Tell-tale Strainer.

Examination of milk samples for bacterial content proved conclusively that the cleansing of the cow's udder and the grooming of her body were absolute necessities. It would be a very progressive step if all and sundry regarded the milk strainer as a superfluous dairy appliance. After all, a strainer only arrests what really should not get in. Foreign matter that might find its way into the milk or portion of it might become soluble and pass through the strainer, constituting thereby a perfect nucleus for a rich bacterial content in very quick time. The gauze of the strainer is the dairy hand's tell-tale, and it is not edifying to see it bumped about before the milking has made much progress so that the flow of milk through its meshes might be imperfectly strained.

Care of Harness.

Harness perishes very quickly if neglected, but if reasonable care is exercised it will last for years. Plated harness should not be kept in the stables, as the gases arising from the decomposition of the excreta tarnish the fittings. Immediately the harness is brought in the dust should be carefully wiped off with a soft cloth or leather, and mud or sweat removed by washing with water, but on no account should too much be used. The bits should be well washed in clean water, thoroughly dried, and rubbed over with a little neatsfoot oil. The leather should be kept soft and pliable by using some dressing. Any one of the proved commercial compositions is suitable and cheap.

Heavy harness does not require the same attention, but it must be kept pliable and tough by oiling at regular intervals. Leather which is not treated soon becomes hard under our dry conditions, and cracks, while the stitching decays. A very suitable dressing is pure neatsfoot oil. Some very effective and cheap mixtures are on the market for dressing heavy harness.

Atherton Tableland Maize Board—Traffic in Maize.

An Order in Council under the Primary Producers' Organisation and Marketing Acts has been issued to deal with the traffic in maize on the Atherton Tableland. The Acts now provide that all maize grown on the Atherton Tableland must be delivered by the growers to the Board or its agents by the nearest road or railway, under conditions fixed by the Board by notice published in any newspaper circulating in the district. Except for delivery to the Board or its agents, a grower must not remove any of the commodity from his premises without the prior consent of the Board; any person doing so will be liable to a penalty of not more than £500.

No person shall remove any maize except with a permit from the Board authorising him to do so. This permit will give the conditions and the period of duration for such removal, as determined by the Board. The Board may refuse to grant a permit without giving reasons. The permit must always be carried, and must be produced for inspection by any member or inspector of the Board or member of the Police Force. The Board may appoint any persons to be inspectors.

Any member or inspector of the Board, or police officer, may, at any place within a radius of fifty (50) miles from the boundary of the area concerned, examine any vehicle suspected of carrying any of the commodity, may order the driver to stop for sufficient time to allow any goods carried to be inspected, and may seize any of the commodity found. Any person disobeying such orders shall be liable to a penalty not exceeding five hundred pounds (£500).

In any prosecution the averment that maize concerned is part of the commodity will be deemed to be proved in the absence of proof to the contrary. The Commissioner of Railways or any shipowner may, on the request of the Board, without incurring liability, refuse to carry any of the commodity, except Interstate consignments.

The Pastern.

In judging of the points of a horse the conformation of the pastern is generally recognised by horsemen to be among the features to which leading importance attaches, this being on account of the intimate bearing which it has both upon the question of the wearing capacity of the legs and character of the action, while in the case of hunters the conformation of this joint, moreover, is of some influence as regards the question of their galloping and jumping.

The essentials sought for in good pasterns, briefly summed up, are that they should be well sloped and of adequate length. Both the length and the degree of slope, of course, vary considerably according to the breed, and these terms are therefore to be taken in a comparative sense. In thoroughbreds, for instance, the pasterns are always longer than they are in less well-bred horses, while they are relatively short in cart horses, as compared with well-bred horses of the light class. Similarly, in regard to the question of slope, one looks for more obliquely placed pasterns in the latter type of horse than in heavy horses used for slow draught work.

33 Gallons Daily from Five Cows.

Near Land's End there is a pedigree Guernsey herd owned, milked, and managed by Mr. E. Gerrish, of Carrallack House, St. Just, Cornwall. This herd, rationed under the Boutflour system, was the first to complete a 1,000-gallon average in the Cornwall Milk Recording Society, and for three successive years, against all breeds, has won the inter-herd challenge cup competition organised by this society.

News has just reached us that one of the cows in the herd, "Chorleywood Programme 3rd," is still adding to her previous wonderful records, and is now milking heavily with her ninth calf. She was born in April, 1920, was unfortunately not recorded during her first lactation, but has since yielded in consecutive lactations 604, 900, 1,123, 1,250, 1,084, 1,642, and 1,290 gallons. She is showing every promise of producing another heavy yield with her ninth calf. All of her calves (seven heifers and two bulls) are living. To give some idea of how Mr. Gerrish has developed the heavy milking capabilities of his Guernseys it might be mentioned that from five cows at one time he maintained an output of about 30 gallons daily for a considerable period, and on one day produced no less than 33 gallons from these five Guernsey cows.—"Live Stock Journal" (England).

Peanut Board.

The Governor in Council has approved of a Notice of Intention to create a reconstituted Peanut Board for a period of ten years. This Peanut Board will apply to all peanuts produced in Queensland. The Board to administer it will consist of four (4) elected representatives of the growers and the Director of Marketing.

All the commodity will be diverted from the growers and become the property of the Board as owners. The peanuts must be delivered to the Board in an unshelled condition, and a grower shall not remove any of the peanuts produced by him from his premises, except for delivery to the Board or its agents, unless the prior consent of the Board has been obtained.

Persons entitled to vote at a referendum or an election shall be those who have produced peanuts for sale in Queensland at any time during a period of twelve (12) months immediately prior to the poll. If a reconstituted Peanut Board is created, the present Peanut Board will go out of existence, and the new Board will take over all assets and liabilities of the old Board.

The existing Peanut Board Levy Regulations dealing with levies to provide for storage facilities, &c., shall continue to be operative during the currency of the new Pool.

Any petition for a poll to decide whether or not the new Pool shall be created must reach the Minister for Agriculture and Stock, Brisbane, before the 30th June, 1930, and must be signed by at least fifty (50) peanut growers.

Nominations for the growers' representatives on the new Board must reach the Under Secretary, Department of Agriculture and Stock, Brisbane, before 5 p.m. on 30th June, 1930. These nominations must be signed by at least seven (7) persons who have grown peanuts for sale during the preceding twelve months.

At the same time nominations are invited until 5 p.m. on the 30th June, 1930, for the election of four (4) growers' representatives on the existing Peanut Pool. Each nomination is to be signed by at least seven (7) persons who have had growing peanuts on areas of not less than one-half (½) an acre at any time during the last twelve months. These latter additional nominations are necessary pending the creation or otherwise of the new Pool. Full particulars will be found in the *Government Gazette* of the 31st May, 1930.

Cheap Experience.

To a shrewd, practical man there is nothing more instructive than a walk over somebody else's farm, for he will be able to note how the land is farmed and the various methods applied. Such a man may learn much by just watching what others are doing in another part of the country. Then, again, by noting how cattle are fed and what rations are being given, the keen man can pick up many a wrinkle worth remembering when he gets home again. Tours are good for the average farmer; they help to give him new ideas and to broaden his outlook, and so inspire him to better farming practice. While it is well to use the same farm for years and years, yet at the same time a man can stay too long in his own locality absorbed in his own methods, and thus may be ignorant of some of the improved methods that are being used outside his own narrow little circle.

Sheep and Wheat—A Valuable Combination.

Sheep are indispensable on the wheat farm. In the control of weeds, in improving the fertility of the land, and in many other ways their indirect value is often of greater importance than the cash return from wool, mutton, &c.

Briefly, the points in favour of combining sheep with wheat are as follows:—

(1) They consume the straw left after the harvest.

(2) They turn weeds to profit, and prevent them from seeding at times when the farmer is unable to deal with them owing to pressure of other work.

(3) Their manure improves the fertility of the land.

(4) When the season is so bad that the crops fail to produce grain, sheep turn them to profitable account.

(5) The income from the farm is rendered more certain, as the farmer is not entirely dependent upon a crop which may be destroyed by fire or hail.

(6) Sheep necessitate the adoption of a rotation, which tends to improve the fertility of the land, check crop diseases, and increase the yield of crops.

(7) They can be used to feed off crops that need such a check.

(8) A supply of cheap mutton is made available for the farmer's own household.

(9) To the above may be added the pride and pleasure derived by the farmer from the possession of a good flock.

—A. and P. Notes, N.S.W. Dept. of Agric.

The World's Grain Exhibition in 1932.

A world's grain exhibition and conference of wheatgrowers will be held at Regina, Canada, from 25th July to 6th August, 1932. Few realise the magnitude of the undertaking and the far-reaching influence it will exercise upon the basic industry of agriculture, particularly upon the quality and quantity of grain production the world over. As Regina is the heart of the largest area in Canada producing wheat and other grain, it was considered the logical point for the exhibition which is being supported by the Federal and Provincial Governments. Entries and exhibits will be received up to 1st March, 1932, to give ample time for judging and the arrangement of each exhibit. The benefits to the agricultural industry the world over to be derived from friendly competition in the "show-ring" of the best grain produced in every land is at once apparent. The prize list provides every indication that its compilation has been made as attractive as possible so that the number and representative nature of the exhibits would reach the maximum. Over $200,000 (£41,667) is being offered in cash prizes for wheat, barley, maize, rye, buckwheat, rice, millet, field peas, soybeans, sunflower, field root seed, and collections of garden vegetable seed, in all comprising nineteen sections subdivided into 55 classes, with 1,600 prizes varying from $2,500 (£500) to $10 (£2). The entrance fees are very modest, particulars of which can be obtained from the Canadian Trade Commissioner, Melbourne.

The conference in connection with the exhibition will be of immeasurable importance, and every effort is being made towards ensuring it being representative of the world's best thought along practical and scientific lines. Experts from many countries, men who are recognised leaders in their own particular fields of activity, are being solicited to take part. In this way, it is hoped to make the conference the "clearing-house" for world thought and knowledge on every branch of field crop production and marketing.

Another Credit Entry in the Cow's Account.

The casein of milk in powder form is used for plywood paint and printers' ink, dressing table requisites, and imitation leather, and now Mr. E. J. Forster, a research chemist of Manly (New South Wales), claims that by combining casein and sawdust or shavings, he can make a board suitable for building material. The board is said to be of extraordinary strength, durability, cheapness, non-absorbent, and non-inflammable, and is to be marketed at 35s. a hundred square feet, compared with 52s. for building pine.—*"The Farmer and Settler."*

A "Shell" Story for Small People.

A charming little publication for children has been produced by the Shell Company of Australia, Limited, for free distribution on application throughout the Commonwealth. The illustrations have been well done by the young Australian artist, Miss Sheila Hawkins, and much attention has been paid to detail. The half-dozen plates have been produced in four colours, and there is a generous sprinkling of black and white drawings. The simple story is that which has appealed to the child mind since time immemorial—of fairies and goblins, and the small girl who is waylaid and ushered into the inner sanctums of fairly life. With its Australian setting it promises to have a wide appeal wherever young people are gathered together—at school, at home, and at play. The booklet is well prepared on tinted art paper, and is generally significant as indicating the upward trend of commercial publications in this country. It is an all-Australian production.

A copy is obtainable on application to the Shell Company, Department Advertising.

Acquisition of Strawberries by Committee of Direction.

Regulation 188 made under the Fruit Marketing Organisation Acts on the 15th May, 1930, provided for the conducting of a ballot of all strawberry growers on the question as to whether an Order in Council be issued declaring that strawberries grown in Queensland for a period of twelve months from the 15th May, 1930, for sale to fruit canners or as fresh fruit on a wholesale basis shall be acquired by the C.O.D. as the owners thereof. A ballot was accordingly conducted by the C.O.D., with the result that, of 613 ballot-papers issued, 354 were returned; of these, 273 were in favour of the acquisition, 72 were against, and 9 were informal. Thus 79.1 per cent. were in favour, and, as this is in excess of the required 60 per cent., the Order in Council has now been issued.

The Order provides that all strawberries grown in Queensland and coming into the possession of any person for the purpose of selling or offering them for sale to any fruit canner or preserver, &c., or for fresh fruit on a wholesale basis, during the period from 10th June, 1930, to 14th May, 1931, shall be acquired by the C.O.D. as owners thereof. The C.O.D. has the power to do all necessary things for the purpose of effectively carrying out the marketing of such strawberries as owners thereof on behalf of the growers. The Order shall have no effect so as to prejudice any interstate contracts which had been entered into prior to such acquisition. The Order shall remain in force from the 19th June, 1930, until the 14th May, 1931.

Reduced Production Costs Mean More Profit.

The urgent need in Australia is to lower the cost of production of the commodities of which we produce a surplus—wool, wheat, butter, and fruit. With falling values for these staple commodities it is essential, if we are to meet the demands of foreign competition, to increase the productivity of each individual worker and cut production costs to the minimum.

The farmer generally pays more attention to the price of his products than to the cost of producing them. But the prices of those commodities sold on a world market—wheat, wool, butter—are largely beyond the control of the farmer. On the other hand, the costs of production, within limitations, are subject to the farmer's control. Various items entering into production costs are virtually fixed. These include taxes, land capital costs, upkeep, and certain general expenses. But the major costs of production, excepting only land capital costs, are not fixed. They vary with the intelligence and skill of the farmer, and the power and equipment he applies to them. It is in the preparation of the land, seeding, tillage, cultivation, harvesting, and hauling of the crops that the major expenses are incurred, and to the degree to which these can be reduced, the profits of the farmer can be increased. The farmer will be compelled to accept world prices for his products so long as he must sell a surplus above domestic needs in the world markets. World consumers will buy from him only to the extent that he can sell as cheaply or more cheaply than other sellers.—Dr. A. E. V. Richardson, in the "Journal of Agriculture," South Australia.

The Home and the Garden.

OUR BABIES.

Under this heading a series of short articles by the Medical and Nursing Staff of the Queensland Baby Clinics, dealing with the welfare and care of babies, has been planned in the hope of maintaining their health, increasing their happiness, and decreasing the number of avoidable cases of infant mortality.

MEASURING BABY'S FOOD.

YOU may think that this is a very simple matter, but it is not so simple as it seems. On the contrary, we often find it a most difficult matter, and sometimes even impossible, to find out by the most careful questioning how much food a baby is really taking. Mothers reckon in teaspoons and tablespoons, but their spoons are not all of the same size. For instance, most of the tablespoons now used contain between one and a-half to two tablespoonfuls. This is a very serious cause of mistakes. If a mother tells us that she is giving to her baby at each meal eight tablespoonfuls of milk carefully measured with her own tablespoon, we think he is probably really getting about twelve tablespoonfuls; but we are not sure. He may be getting ten tablespoonfuls or perhaps fifteen. The most careful written directions as to quantity are of no value unless we know exactly what the mother measures the quantity with.

In measuring solids such as sugar or dried milk the danger of making large and serious mistakes is greater still. A teaspoonful of sugar is a quantity that depends not only on the size of the spoon, but on how it is filled. It may be a strictly flat teaspoonful, in which the sugar has been carefully scraped off level with the edge of the spoon. It may be a heaped teaspoonful which with the same spoon is nearly three times as much. It may be an "ordinary" teaspoonful, which is neither one nor the other, but may be anything in between. Even if we all use flat teaspoonfuls we may go seriously wrong, for some powders such as milk, sugar, and dried milk are compressible. That is, much more can be got into a flat teaspoonful if the powder is squeezed. No two women squeeze exactly alike, or with the same strength. Even the same woman does not always squeeze the same. She probably squeezes harder, if she has just had a few words with her husband. Some nurses were asked to measure flat tablespoonfuls of dried milk all with the same spoon, and by careful weighing it was found that none of the tablespoonfuls weighed the same; and the highest weight was more than twice as much as the lowest.

How to Measure Correctly.

In measuring milk and water do not, as a general rule, use spoons at all. Most feeding bottles are marked with divisions into ounces and tablespoonfuls, and these divisions are usually sufficiently accurate. In them a tablespoonful is exactly half an ounce. It is shorter to say "one ounce" than "two tablespoonfuls," and it is better, for if we can get mothers to think in ounces, they will not be muddling with spoons. If you suspect that your bottle is not correctly marked, or if you want to be very precise, get a glass measure marked in ounces from any chemist's shop.

In measuring powders like sugar or dried milk never use any sort of spoon but one. That is a "clinic tablespoon" or a "clinic teaspoon" which is of a fixed size. The two "clinic spoons" may be bought at any chemist's for one shilling, and it will be the best shillingsworth you have ever bought. Do not dip the spoon into the sugar basin or tin of condensed or dried milk. Pour the sugar or dried milk into the spoon till it is overful, but do not squeeze it. Take a knife held at right angles to the spoon and gently scrape off what lies above the level of the spoon in one sweep. You will then quickly and easily measure a true flat spoonful. Remember that "clinic" spoons should always be used to measure sugar, dried milk, and other powders, but they are not needed to measure water, milk, and other fluids.

RESPIRATORY INFECTIONS.

Influenza and other Ailments.

The "common cold," which was the subject of our discourse last month, is not the only disease whose causative germs exist in the secretions of the mouth, nose and throat. There are a host of them. Influenza, which at long intervals becomes a world-wide scourge, spreads in exactly the same way. Perhaps it would be more correct to speak of the influenzas, for there seems to be a number of similar infections as yet indistinguishable, ranging from a virulent and fatal infection to the "common cold," which is so unwisely despised and neglected. Measles commences just like a "cold," for which it is usually mistaken until the fourth day of the disease, when the rash appears on the skin. Whooping cough commences as an ordinary cough, which gradually gets worse, but cannot be recognised until a week or more have passed. Both these diseases are most infectious in the early stage, before their nature is recognised, and are therefore most easily spread. They are most common and most fatal in children under five, to whom they are conveyed directly by fingers, toys, &c., contaminated by the saliva and mucus from diseased mouths and throats, or by inhaling these secretions in the form of a fine spray which is coughed out by the sufferers. Diphtheria is similarly spread, but this disease will have to be dealt with in another discourse. The list is not yet exhausted; to it we must add scarlet fever, meningitis, and infantile paralysis, whose epidemics leave so many children sadly crippled. The last two are spread entirely not by sick people, but by apparently healthy carriers of the disease germs.

Teach Children Clean Habits.

As these diseases are conveyed by the secretions of the organs concerned in breathing or respiration, it is convenient to speak of them as respiratory infections. These respiratory infections are not lessened in any way by ordinary sanitation, which has so greatly reduced the number of intestinal or bowel infections. They are not affected at all by good or bad drainage, by nasty smells, by flies, mosquitoes or other insects. They are certainly increased by overcrowding. They are extremely difficult to deal with by isolation, partly because they are often very infectious before the sufferer realises that he is really ill, partly because most people would resent being isolated for complaints which they regard as trivial, and which indeed are so in many cases. The worst spreaders are not the very sick but those who are not too sick to go about and mix with other people. These diseases spread with the greatest ease among children, because their mothers have not understood the importance of teaching children clean habits. As is well said in the following quotation:—

> "Not only is the saliva made use of for a great variety of purposes and numberless articles are for one reason or another placed in the mouth, but for no reason whatever, and all unconsciously, the fingers are with great frequency raised to the lips or the nose. Who can doubt that if the salivary glands secreted indigo, the fingers would be continually stained a deep blue, and who can doubt that if the nasal and oral secretions contain the germs of disease, these germs will be almost as constantly found on the fingers? All successful commerce is reciprocal, and in this universal trade in human saliva the fingers not only bring foreign secretions to the mouth of their owners, but these, exchanging them for their own, distribute the latter to everything the hand touches. This happens not once, but scores and hundreds of times during the day's round of the individual. What avails if the disease germs do die quickly? A fresh supply is furnished each day. Besides the moistening of the fingers with saliva, the mouth is put to numerous improper uses, which may result in the spread of infection. It is used to hold pins, strings, pencils, paper, and money. The lips are used to moisten the pencil, to point the thread for the needle, to wet postage stamps and envelopes. Children have no instinct of cleanliness, and their faces, hands, toys, clothing and everything they touch must of necessity be continually daubed with the secretions of the nose and mouth. It is well known that children between the ages of two and eight years are more susceptible to scarlet fever, diphtheria, measles, and whooping cough, and it may be that one reason for this the great opportunity that is afforded by their habits at these ages for the transfer of the secretions. Infants do not, of course, mingle freely with one another, and older children do not come in such close contact in their play, and they also begin to have a little idea of cleanliness."

It must not be supposed that these unclean habits are confined to children. At any post office daintily dressed women may be seen needlessly licking dirty postage

stamps. Go to your bank, and the very respectable cashier will count your notes, leaving on each a collection of his own germs, meanwhile ingesting those already deposited on them by other people. Even the trained hospital nurse may be observed to moisten her fingers on her lips as she turns the pages of her notebook, heedless of the disease germs which exist in hospital dust. Let us hope that the next generation may be trained in cleaner habits. If so, they will be more healthy.

MENACE OF THE HOUSE-FLY.

SOME SUGGESTIONS FOR CONTROL.

Although the season during which the house-fly constitutes the most serious nuisance is beginning to draw to a close, it is still proving a source of great annoyance to housewives, and especially, perhaps, because of the disabilities often attached to rural conditions, to those "outback." Outbreaks of gastro-enteritis among young children have lately caused considerable anxiety, observes the Assistant Organiser of the New South Wales Agricultural Bureau in the current "Bureau Record," and the result of this disease alone, carried as it often is by the fly, should be sufficient to warrant the use of every method possible to control this dangerous insect. The habits of the fly, too, are so objectionable that the more we know of it the more we realise that it constitutes a menace to the community.

The ordinary house-fly needs little description. It is all too common and easily recognised. If we were to examine the insect closely we would see that its body and legs are covered with a great number of fine hairs. Each foot is provided with two tiny pads, which also are covered with minute hairs, secreting a sticky substance by means of which the fly holds on to the walls, ceiling, &c. The sticky substance, together with the hairs, picks up innnumerable germs as the fly wanders through garbage receptacles, drains, stables, sick rooms, and other places where harmful bacteria abound. These, of course, are readily carried to the kitchen, dining table, and, worst of all, to the baby's dummy and bottle.

Another means by which the fly distributes germs is by its method of obtaining nourishment. Its mouth is rather a singular structure, prolonged into a kind of trunk or proboscis. Thus any food it requires must be sucked up through this trunk in a liquid form. When the insect lights on a piece of solid food, it immediately proceeds to soften it by exuding some drops of moisture from its own digestive system, then slowly sucks the moistened food into its mouth. It thus leaves behind, on the food which we may be eating some liquid from its own internal organs, teeming, probably, with minute bacteria of many kinds. These, if our systems are not in a strong and healthy condition, may do untold damage by setting up within us the beginnings of diseases, such as typhoid, tuberculosis, and summer digestive complaints, especially in children.

Life History.

The life history of the house-fly is one which adds to our objection to its frequenting our living quarters. It is always a lover of filth and will seek any decaying animal or vegetable matter on which to deposit its eggs, knowing that the young will have ample organic matter for food when they are hatched. The eggs, which are minute white oval-shaped objects, about one-twentieth of an inch in length, are deposited in clusters; about 120 to 150 eggs are laid at a time, and as each female fly can lay as many as four deposits of eggs in her lifetime, we have some idea of the rapidity with which the insects increase. In warm weather the eggs hatch and the larvæ emerge in about twenty-four hours.

These tiny creamy white maggots are pointed at the head and broaden out to a blunt posterior end, and when matured are about one-quarter to one-third of an inch in length. They eat greedily, increasing rapidly in size, and shed their outside skin three times before they enter the pupal stage, which is reached in from five to seven days. The last skin of the maggot encloses the pupa, in which stage it remains for a few days, varying according to weather conditions, after which the skin breaks and the adult fly emerges.

Probably the most favoured spot for breeding is the stable manure heap, but carcasses of animals, heaps of decaying vegetable matter, sanitary pans and pits, neglected garbage tins—in short, anywhere where organic matter is allowed to decay, especially in moist places which are not too dark nor exposed to the strong rays of the sun, make ideal breeding places.

A Difficult Problem.

The control of flies is a very difficult problem, and no effective measures should be considered too much trouble in combating the pest. Firstly, the number of breeding places should be reduced to a minimum.

Garbage tins should be kept covered and as dry as possible, the contents being burned at regular intervals. Fowl yards, pig and calf pens, and milking yards should be a good distance from the house and kept as clean and dry as possible. Heaps of manure and compost, kept for the garden, should be tightly compacted and covered, if possible. If the heap is treated with borax (1 lb. to 8 cubic feet of manure) sprinkled on the surface and sprayed with water, breeding will be reduced considerably. Sanitary pits and pans, if kept covered and treated with liberal supplies of ashes, sawdust, or dry earth, become safe from the breeding of flies to a considerable extent. Various disinfectants or kerosene will destroy the maggots if allowed to hatch.

No effort should be spared in keeping flies from the house. The screening of doors and windows (better still of verandas) is the most efficient means of preventing the pest from entering the house. The framework for the gauze should be made of well-seasoned timber, otherwise it will warp, thus making cracks through which the flies can crawl. The fireplaces, too, should be screened, as the flies readily find their way down the chimney.

Protective Measures Well Worth While.

This, of course, incurs considerable expense, but the preservation of health and the saving of untold annoyance and waste of food attacked by the fly repays the outlay, and the precautions mentioned should be regarded as of primary importance in home improvement. Sticky papers are to be recommended if out of reach of children and pets—say, suspended in the centre of the room. Many types of traps, all of which are more or less efficient, are on the market; a bait of moist tea-leaves and sugar seems to attract the insects into the trap and is less objectionable than many other types of bait. Sweetened milk and water, to which formalin has been added (one teaspoonful of formalin per cup) placed in saucers out of reach of infants and pets, kills many flies, but they are apt to fall round the room and become objectionable if not swept up immediately.

Closing a room and spraying with one of the many commercial liquids or insect powders is also effective. This is best done at night, so that the dead flies may be swept up early in the morning.

At all times it should be the duty of every member of the community to take all possible measures to fight the fly and to keep food free from its attacks.

KITCHEN GARDEN.

Nearly all spring and summer crops can now be planted. Here is a list of seeds and roots to be sown which will keep the market gardeners busy for some time: Carrots, parsnips, turnip, beet, lettuce, endive, salsify, radish, rhubarb, asparagus, Jerusalem artichoke, French beans, runner beans of all kinds, peas, parsley, tomato, egg-plant, sea-kale, cucumber, melon, pumpkin, globe artichokes. Set out any cabbage plants and kohi-rabi that are ready. Towards the end of the month plant out tomatoes, melons, cucumbers, &c., which have been raised under cover. Support peas by sticks or wire-netting. Pinch off the tops of broad beans as they come into flower to make the beans set. Plough or dig up old cauliflower and cabbage beds, and let them lie in the rough for a month before replanting, so that the soil may get the benefit of the sun and air. Top-dressing, where vegetables have been planted out with fine stable manure, has a most beneficial effect on their growth, as it furnishes a mulch as well as supplies of plant food.

FLOWER GARDEN.

All the roses should have been pruned some time ago, but do not forget to look over them occasionally, and encourage them in the way they should go by rubbing off any shoots which tend to grow towards the centre. Where there is a fine young shoot growing in the right direction, cut off the old parent branch which it will replace. If this work is done gradually, it will save a great deal of hacking and sawing when next pruning season arrives. Trim and repair the lawns. Plant out

antirrhinums (snapdragons), pansies, hollyhocks, verbenas, petunias, &c. Sow zinnias, amaranthus, balsam, chrysanthemum, marigolds, cosmos, coxcombs, phloxes, sweet peas, lupins; and plant gladiolus, tuberoses, amaryllis, pancratium, ismene, crinums, belladonna, lily, and other bulbs. In the case of dahlias, however, it will be better to place them in some warm, moist spot, where they will start gently and be ready to plant out in a month or two. It must be remembered that this is the driest of our months. During thirty-eight years the average number of rainy days in August was seven, and the mean average rainfall 2.63 in., and for September 2.07, increasing gradually to a rainfall of 7.69 in. in February.

FLOWERING SHRUBS.

Lagerstrœmia indica varieties.—There are many beautiful forms of this shrub on the market, and the finest varieties have been raised in Queensland—*L. Matthewsii* and *L. Earesiana;* the colours of both are lilac, but *Matthewsii* is the darker shade. The heads of bloom of both varieties attained a length of about 24 in., and the individual flowers are a couple of inches across. The plant may be grown in any small garden, and the size may be kept at the will of the gardener. Specimens growing in Brisbane range from a few feet high to 20 ft.

The plant stands severe trimming; in fact, it stands the knife so well that it can be grown almost any height by being cut back in July every year, like a grape vine. One of the finest specimens of *L. Matthewsii* can be seen growing on the river side of the Customs House garden. Plants are easily raised from cuttings taken from the previous year's wood and planted during July and August. Also plants well established may be purchased at any of the nurserymen's stores.

Gardenias.—In the earlier days of Brisbane there were few gardens without a gardenia; now they are rarely seen. *G. Thunbergii* is one of the varieties that should be grown. The flowers are pure white, exquisitely scented, and the foliage of all the varieties are a glossy green. These plants are not too fond of pruning, and should be allowed to grow in their own way. *Gardenia florida* is mostly grown for florists' use, the flowers being perfect in form and not having the heavy perfume of the other varieties. All the gardenia family are subject to scale diseases, but are easily kept clean by occasional sprayings with boiler water that has plenty of soap in solution. The plants never attain any size, so are very useful in small gardens.

Oleander.—In the northern part of the State these plants flourish, and are much admired by visitors from the Southern States and overseas.

The plants attain a fair size if not kept within bounds. In some of our northern towns it is quite common to see plants 20 to 30 ft. high, and of many colours. The plants are grown in Brisbane, but by a few only, yet they grow just as well here as in the North. The smaller growing varieties should be more extensively grown, and the pink "Carnea," white "Madonna," and carmine "Delphine" are all good old varieties.

When growing the plants in small gardens it is necessary from their earliest stages of growth to keep them well headed back, the young wood of the previous year being the flowering wood.

Lantana.—The small varieties of lantana are not in common with the pest scattered all over Queensland, and are very beautiful when trained as hedges or shrubs. The tangerine coloured variety and the canary yellow variety are the two usually grown in Southern Queensland. Splendid specimens of these are growing in the Botanic and Museum gardens. The plants flower for nine months of the year, and will grow in almost any soil and will stand fairly hard conditions.

LANDSCAPE GARDENING.

The landscape gardener must possess a good deal of artistic taste, as he deals with the landscape and its improvement. Should alterations be necessary, they must be carried out in as natural a manner as possible, and they must be in unison with the surrounding country. Any existing natural features may be made the most of.

If trees shut out a desirable view, they may with care be removed. Tree thinning also becomes necessary when some are spoiling others. It is better to have one good specimen than several poor ones. When tree planting, the gardener must look forward, and consider their size when maturity is reached.

Broad stretches of lawn may be broken up with shrubs or specimen trees, or beds of flowers. The character of the soil and the situation must be taken into consideration when planting. It is of no use to plant trees or shrubs that are not likely to succeed, and if doubtful ones are included they must be in positions where they can be easily replaced should they fail. The character of the dwelling must also be taken into consideration.

Vista making is an important part of landscape gardening, and to carry it out the various points of vantage have to be ascertained and their values determined. The outline of the landscape from the various vantage points must be undulating, not straight or unbroken, and though special hues in greenery may be made the most of, they must not be repeated until the eye wearies of them.

Paths should be as few as possible, and each should be made for some definite purpose. They should run in bold but graceful curves, especially when made of gravel.

If summer houses are included they should not stand out aggressively, and they should be covered with creepers as quickly as possible.

TRANSPLANTING FRUIT TREES.

The transplanting of partially developed fruit trees is seldom attempted on account of the risk of failure and the trouble entailed in endeavouring to retain sufficient fibrous roots to ensure a reasonable prospect of success. Trees up to five or six years old, where subject to the necessary preliminary treatment, can not only be removed without risk of failure, but transported satisfactorily over long distances. It will be recognised that the sustenance of the plant is absorbed by the small or fibrous roots in the immediate vicinity of their terminals, and by inducing a profusion of these within a short radius of the stem the chances of failure are practically nil. A profusion of small roots may be ensured by cutting through at the desired distance from the stem (15 to 24 inches, according to the size of the tree) all roots to a depth of 18 inches. In so doing a trench is made around the tree, and the ends of roots carefully pared if the cutting has not been ''clean.'' The trench is then refilled with soil containing a good supply of humus, and in about three months' time the original root ends will have developed a good supply of fibres. At the time of removal these are not interfered with more than can be avoided, the necessary excavation for removing the tree from its original position and severance of any lower roots being made beyond the terminals of the young root growth. The head of a large tree should be materially shortened at the time of removal. The cutting of roots in the first instance should be performed when the tree is in a dormant state; in the case of citrus, conditions are generally favourable about March. Tropical varieties handled in this manner can be removed at almost any time after sufficient roots have formed and hardened, and may be first treated at any time of the year at the period known as ''between growths.''—GEO. WILLIAMS, Director of Fruit Culture.

PROPAGATION BY CUTTINGS AND LEAVES.

The herbaceous character and free-growing nature of the majority of plants that are used for summer bedding renders their propagation easy. Large numbers of plants are required in as short a time as possible, and without the expenditure of much time or labour, and unless a plant is easily propagated it is of little value in the bedding department.

Autumn propagation is preferred for the more robust of these plants, cuttings at that time being both plentiful and vigorous and the season favourable for the quick production of roots. If the necessary preparation of beds, boxes, and soil has been attended to, the whole of the cuttings may be put in during autumn and rooted before the cold weather comes. It may be laid down as a general rule that all stout, free-growing cuttings prefer a strong loamy soil, while those of a more delicate nature and that have fewer roots are safest when planted in light sandy soil containing a large proportion of leaf mould.

The cuttings should be planted firmly, in rows about 6 inches apart, and should receive a good watering as soon as planted, after which they will require little attention beyond the removal of dead leaves and a sprinkling of water overhead should the weather be dry. As soon as rooted, or at least before the approach of the cold, wet weather, they should be placed in boxes, pans, or pots, in which they are to winter. For smaller quantities it will be found best to plant the cuttings in shallow boxes, in which they may be allowed to remain until the spring.

Pentstemons, phloxes, pinks, antirrhinums, and a host of other bedding plants of robust constitution may be increased in the autumn in this way. Boxes are most convenient for these purposes. The bottom should be pierced with several holes an inch or more in diameter, and covered with an inch of ashes or crocks as drainage, the box being then filled with sandy soil, using loam, leaf mould, or whatever mixture the nature of the cuttings would require.

Under certain conditions buds are formed on the leaves of a large number of plants, such buds being called adventitious, to distinguish them from the stem or normal buds, which are found on all plants, and which are borne in the axils of the leaves. It is supposed that the leaves of a very large proportion of plants possess this power to develop extraordinary buds, and that their failing to do so when tested by the gardener is due to improper treatment rather than to absolute impotence in the leaf itself.

It is, however, only in a few cases that leaf-cuttings are resorted to for purposes of propagation. Such plants as begonias, gloxinias, and a few others of more or less succulent nature are the only ones for the increase of which leaf-cuttings are employed. Numerous other plants have proved capable of propagation by this means, some of them being not at all succulent-leaved, while on the other hand, plants of excessive succulence have proved unable to form buds when tested in the same way. In some cases where leaf-cuttings have been tried, roots were freely developed but no bud was formed. Camellias may be mentioned as plants whose leaves root freely but do not develop buds, although left in the propagating house for several years.

Where it is desirable that a new plant should be propagated as abundantly and as rapidly as possible, it will be found often advantageous to place the leaves that are removed from stem cuttings in the propagating frame and treat as advised below. To anyone acquainted with the nature of the following list of plants, it will be apparent that no rule can be laid down for the guidance of the cultivator, either when based on the texture of the leaves or the nature of the plants. Begonias, clianthus, gesnera, gloxinia, hoya, lilium, watercress, and many others may be propagated by means of leaves or portions of leaves.

Turning now to the plants that are usually increased from cuttings made of leaves, a word may be said on the treatment such leaves require, and the best time of the year for the operation. Gloxinias may be dealt with all times of the year when leaves are available, the most favourable period being autumn. Well-matured leaves should be selected, avoiding those in which the yellowness of decay has appeared. The leaf-stalk may be severed at any point, it being unnecessary to secure them with heel or portion of the stem. The blade may then be divided longitudinally, so that a large leaf would form about half a dozen cuttings. It is, however, better when the blade is cut into sections, each section having a portion of the midrib attached to its base.

Some prefer severing the midrib into about a dozen pieces, leaving the blade intact. In this way a plant is obtained from each portion of the midrib, bulbils being developed on the lower end of each. Where the latter plan is adopted the whole leaf must be pegged on to a pan of sandy soil. If the leaf is divided up into smaller pieces, pots may be used, filling the pots half-full of drainage, and the other half with a light sandy soil. Into this the cuttings must be placed obliquely, so that whilst held firmly in the soil their bases are only a little below the surface. A frame in a propagating house will be the most suitable place for the cuttings till rooted. In a small bush-house a position on a shelf would answer equally well for gloxinia cuttings.

Begonias may be treated as suggested for gloxinias; or, if to be propagated on a large scale, a frame containing cocoanut fibre may be used, pegging the begonia leaves on to the fibre.

Reference may be made to the reproductive nature of some fern fronds, especially the aspdeniums, nephrodiums, aspidiums, the fronds of which usually bear buds, which eventually form plants. The requirements of such leaves, when wanted for propagating purposes, are very much the same as those of the plants themselves.

The scales which form lilium bulbs may be used for propagation, as if fresh when gathered and placed in sandy soil they root and form small bulbs capable of growing into large plants. All these exceptional ways of obtaining a stock of plants are only resorted to in exceptional cases; they are chiefly of physiological interest, showing as they do how nature has provided plants with auxiliary powers for their reproduction, which are held in reserve till called upon by the failure of the normal proper means to fulfil the functions of increase or reproduction.

VALUE OF EARTH WORMS.

It is evident that not every gardener can decide whether the common earth worm is a friend or foe. Who has not seen the gardener, when digging, industriously remove every worm found?

Now, speaking generally, these creatures are more friends than otherwise, although they are far too numerous in some gardens at certain periods of the year. As a rule, they do more good than harm by allowing water and air to pass through the soil more freely, and in other small ways assist the gardener.

They may do a little harm by working among the roots of seedlings, also, of course, on lawns, bowling and golf greens, where they may be regarded as pests, rendering the use of lime water necessary to eradicate them.

SLUGS AND SNAILS.

Slugs and snails are troublesome in many gardens—in some more so than in others, and if they are not dealt with in some way a good deal of damage may be done during the year.

The value of lime and soot is pretty well known, but both must be used carefully, or the plants it is intended to protect may be damaged. Ashes in a dry state are also effective in keeping them off. In using these insecticides they must be used in lines or around the plants in a dry, powdery form.

If the garden soil is regularly limed and kept sweet there is less chance of the slug increasing. Watering with alum water is also death to snails and slugs.

Farm Notes for August.

Land which has been lying fallow in readiness for early spring sowing should now be receiving its final cultivation prior to seeding operations. Potato-planting will be in full swing this month, and in connection with this crop the prevention of fungoid diseases calls for special attention. Seed potatoes, if possible, should be selected from localities which are free from disease; they should be well sprouted, and, if possible, should not exceed 2 oz. in weight. Seed potatoes of this size are more economical to use than those large enough to necessitate cutting. If, however, none but large-sized seed are procurable, the tubers should be cut so that at least two well-developed eyes are left. The cut surfaces require to be well dusted with slacked lime, or wood ashes, as soon as possible after cutting. Where it is necessary to take action to prevent possible infection by fungoid disease, the dipping of potatoes in a solution of 1 pint of 40 per cent. formalin to 15 gallons of water, and immersing for one hour, will be found effective. Bags intended for the subsequent conveyance of tubers to the paddock should also be treated and thoroughly dried. After dipping, spread out the potatoes and thoroughly dry them before rebagging. Where the tubers are cut, the dipping is, of course, carried out prior to cutting.

Arrowroot, yams, ginger, and sugar-cane may be planted this month in localities where all danger from frosts is over.

Maize may be sown as a catch crop, providing, of course, that sufficient soil moisture is available.

Sweet-potato cuttings may also be planted out towards the end of the month.

Weeds will now begin to assert themselves with the advent of warmer weather; consequently cultivators and harrows should be kept going to keep down weed growths in growing crops and on land lying fallow, as well as on that in course of preparation for such crops as sorghums, millets, or panicums, maize, and summer-growing crops generally.

Tobacco seed may be sown on previously burnt and well prepared seed-beds.

Orchard Notes for August.

THE COASTAL DISTRICTS.

The bulk of citrus fruits, with the exception of late ripening varieties, will now have been marketed, and cultural operations, pruning, spraying, &c., should be receiving attention. Where trees show indication of impaired vigour, pruning should be heavy, both in respect of thinning and shortening branches. Where trees are vigorous and healthy a light thinning only will be necessary, except in the case of the Glen Retreat Mandarin, which in coastal lands is invariably disposed to produce a profusion of branches with consequent overproduction and weakening of the constitution of the tree in addition to the fruit being small and not of the best quality. Where white louse is present on the main stem (where it almost invariably makes its first appearance) or branches, spraying with lime sulphur solution in the proportion of one part of the concentrate to ten parts of water after the centre of the tree has been opened up by pruning will be found most beneficial.

In dealing with trees which show signs of failing, investigation should be made near the ground level for indications of collar rot and in the North Coast district particularly, for the presence of the weevil root-borer which may attack the roots in the vicinity of the thin bases or at some feet distant. A very light application or paradichlor, buried a few inches under the soil in circles around the tree and the surface tamped firm is considered efficacious in destroying the pest. The distance between the circles (shallow openings connected throughout) should not be more than 18 inches. It may be necessary to repeat the application at three to four weeks' intervals.

Spraying with Bordeaux mixture is desirable as it will, if properly applied, destroy the spores of various fungi later attacking both foliage and fruit.

Where for any reason healthy trees of vigorous constitution are unprofitable they should now be headed back—in fact, the whole of the top removed, leaving only a few selected ''arms'' of previous branches, all other branches being cut clean away at their base. Three or four main arms, whose length will vary from 2 to 4 ft. according to the size of the tree, will form the future head of the tree and from these numerous shoots will originate; these shoots in turn are reduced according to circumstances, usually from two to five on each arm, and given fair attention they will be in a fit condition to receive selected buds from a prolific tree by next autumn. It is advisable when the shoots intended for budding have attained a length of about 6 inches to nip off their terminals for the purpose of stiffening their growth, otherwise they are liable to be blown off by winds. All branches or parts removed in pruning should be carefully collected and burned. Applications against pests and disease could hardly be satisfactory if the material for reinfestation is available throughout the orchard.

Working the land is essential, and disc implements give best results. Before ploughing it is advisable to apply the necessary fertiliser, not just around the trees beneath their branches, but over the whole orchard, the feeding roots mainly extending beyond the extremities of the branches. The depth to which ploughing should be effected will depend on the nature of the soil and its original preparation. Where the subsoil is of a permeable nature, or has been broken up in the first instance, ploughing could be much deeper than on land where due consideration had not been given to this practice. It will also be noted that among some of our light loams that fertility is confined to a shallow depth, where it would be futile to persist in deep ploughing to force the roots into a subsoil from which they could derive but little sustenance. Following upon ploughing, the soil should be further treated until finely broken; the implement necessary will depend upon the constituency of the soil. Generally a good harrow will meet all requirements. On the completion of ploughing between rows an open furrow should not be left on the border or margin, but two or three furrows should be turned back to fill this and the whole then worked sufficiently to leave an even surface throughout the orchard. Except for the purpose of turning in fertiliser or green manure, a good type of disc cultivator can be substituted for the plough and will give at least an equal result.

The planting of trees may be continued and with the exception of custard apples (which should be left until the end of August) should be expedited. The planting of citrus trees this season has been inextensive, but there is a much better outlook for orange production than has been previously offered, and attention should be confined mainly to good varieties of this class—viz., Jaffa and Siletta, with a lesser quantity of late Valencia. The preserving of orange juice will very materially assist in the absorption of our crop, and the fact that the trees develop much more rapidly in this State than in Southern producing regions is distinctly in our favour,

also our fruit contains a much higher sugar content. This, however, is not to be accepted as an invitation to continue the practice of sending immature fruit to the Southern markets.

Grape vines should be pruned, and where cuttings for planting are required these should be selected, trimmed, and heeled in slightly damp soil. Canes intended for cuttings should not be allowed to lay about and dry out, but treated the day they are severed from the plant. Cuttings are frequently made of excessive length. Ten to twelve inches is a fair length, allowing for insertion in the soil to admit of the top bud with a short section of the internode to protrude. Growth is only desired from the upper or exposed bud.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

All pruning other than that applied to peaches and varieties which are late in coming into growth should be completed this month, and the planting of young trees, if not already done, should no longer be delayed. Early planting is preferred, the sooner after the fall of leaves the better. The time is opportune (when there is indication of the buds swelling) to work over (where the stock is reasonably vigorous) unprofitable trees. Strap grafting, as advised by the local field officers, is the most satisfactory method of top-working deciduous trees.

The pruning of vines should be postponed as long as circumstances permit, and these can only be gauged on actual observation as they are subject to much variation.

Late spraying against San José scale where present should be applied with an efficient oil emulsion before any growth appears. Each particular brand has its advocates. Where the scale is persistent, a 2 per cent. solution of Volck may be applied subsequent to the appearance of foliage. Both of these sprays are efficacious against peach or other aphis at a much reduced strength. One per cent. has given satisfactory results. The usual winter working of the land is essential for the retention of moisture and aeration of the soil, but in shallow soils in which many orchards are planted deep working is most detrimental. The matter of seedling stocks for apples and the inferior plants frequently received from Southern nurseries prompts a query as to how many seeds have been stratified for spring planting, and if any effort is being made towards raising a local supply of nursery stock. In earlier years citrus planters were much dissatisfied with Southern supplies, which led to the establishment of local nurseries and later to bud selection. There is certainly sufficient enterprise and energy in the Stanthorpe district to make a similar attempt. Its application only is required.

TO NEW SUBSCRIBERS.

New subscribers to the Journal are asked to write their names legibly on their order forms. The best way is to print your surname and full christian names in block letters, so that there shall be no possibility of mistake.

When names are not written plainly it involves much tedious labour and loss of valuable time in checking electoral rolls, directories, and other references. This should be quite unnecessary.

Some new subscribers write their surname only, and this lack of thought leads often to confusion, especially when there are other subscribers of the same surname in the same district.

Everything possible is done to ensure delivery of the Journal, and new subscribers would help us greatly by observing the simple rule suggested, and thus reduce the risk of error in names and postal addresses to a minimum.

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY D. EGLINTON, F.R.A.S., AND A. C. EGLINTON.

TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

	July, 1930.		August, 1930.		MOONRISE. July, 1930.	MOONRISE. Aug., 1930.
Date.	Rises.	Sets.	Rises.	Sets.	Rises.	Rises.
					a.m.	a.m.
1	6.46	5.5	6.37	5.19	10 36	10.50
2	6.46	5.5	6.36	5.20	11.9	11.25
3	6.46	5.5	6.36	5.20	11.43	12.0
					p.m.	p.m.
4	6.46	5.6	6 35	5.21	12 15	12.43
5	6.46	5.6	6 34	5 22	12.49	1.33
6	6.46	5 7	6.33	5 23	1.22	2.25
7	6.46	5.7	6.33	5.23	2.1	3.19
8	6.46	5.8	6 32	5.24	2.47	4.13
9	6.45	5 8	6 31	5 24	3 36	5 8
10	6.45	5.8	6.30	5.25	4 28	6.4
11	6.45	5.9	6 29	5.25	5.24	6.52
12	6.45	5.9	6.29	5.26	6.18	7.50
13	6.45	5.9	6.28	5.26	7.11	8.42
14	6.45	5.10	6 28	5.27	8.7	9.34
15	6.45	5.10	6.26	5.27	9.0	10.27
16	6 45	5.11	6.25	5.28	9.53	11.27
17	6 44	5.11	6 24	5.28	10.46	...
						a.m.
18	6.44	5 12	6.23	5.29	11.39	12.27
19	6 44	5.12	6.22	5.29	...	1.31
					a.m.	
20	6.43	5.13	6.21	5.30	12.38	2.34
21	6.43	5.13	6.20	5·30	1.37	3.39
22	6.43	5.14	6 19	5.31	2.43	4.41
23	6.42	5 14	6 18	5.31	3.47	5.35
24	6.42	5.14	6.17	5.32	4.54	6.21
25	6.41	5.15	6.16	5.32	5.58	7.2
26	6.41	5.15	6.15	5.32	6.58	7.36
27	6.40	5.16	6.14	5.33	7.48	8.11
28	6.40	5.16	6.13	5.33	8.30	8.45
29	6.39	5.17	6.12	5.33	9.7	9.19
30	6.39	5.17	6.11	5.34	9.40	9.57
31	6.38	5.18	6 10	5.34	10.15	10.40

Phases of the Moon, Occultations, &c.

3 July	☾	First Quarter	2 3	p.m.
11 ,,	○	Full Moon	6 1	a.m.
19 ,,	☽	Last Quarter	9 29	a.m.
26 ,,	●	New Moon	6 41	a.m.

Apogee, 13th July, at 11.36 p.m.
Perigee, 26th July, at 8.6 p.m.

On the 16th Venus will pass from west to east of Neptune, on its northern side. Neptune will be invisible without telescope or binoculars, but Regulus, the brightest star in the fine constellation Leo, will be 2½ degrees westward of Venus. They will be approaching the western horizon, 12½ degrees north of west, about two hours after sunset. Observers using a telescope will find Neptune only 2 minutes westward of Venus, but 40 minutes southward.

Mercury will rise at 5.37 a.m. on the 1st. On the 15th it will be on the far side of its orbit, beyond the Sun and invisible.

Venus will set at 7.47 p.m. on the 1st and at 8.2 p.m. on the 15th.

Mars will rise at 6.12 a.m. on the 1st and at 3.0 a.m. on the 15th.

Jupiter will rise at 6.12 a.m. on the 1st and at 5.31 a.m. on the 15th.

Saturn will be in conjunction with the Sun on the 1st and therefore invisible. It will be on the far side of its orbit, about 885,000,000 miles beyond the Sun. On the 15th it will rise at 4.1 p.m.

The Southern Cross will reach the highest point of the circle, 60 degrees in diameter, which it makes daily around the south-celestial pole, at about 6 p.m. on 1st July and about 4 p.m. on the 31st. It will then be on the meridian due south, in an erect position, reaching a height of 57 degrees at Brisbane, but only 50 degrees at Charters Towers, or 49 degrees at Townsville, reckoning by a line through the cross from the two pointers.

1 Aug.	☾	First Quarter	10 26	p.m.
9 ,,	○	Full Moon	8 58	p.m.
17 ,,	☽	Last Quarter	9 31	p.m.
24 ,,	●	New Moon	1 37	p.m.
30 ,,	☾	First Quarter	9 57	a.m.

On the 5th Mercury will pass Neptune, apparently very close to it on its northern side. Telescope or binoculars will be required to see the latter. The two planets will set an hour and a-half after the Sun, about 6 degrees further north on the western horizon.

The Moon will pass from west to east of Saturn at midday on the 6th when below the horizon. When both become visible in the east, soon after sunset, Saturn will be about 6 degrees north-westward of the gibbous moon.

Mars will be in conjunction with the Moon at 4 a.m. on the 20th, an hour and a-half after they have risen, Mars being 4 degrees to the southward of the Moon.

On the following morning, at 8 o'clock, the Moon will pass 5 degrees northward of Jupiter, but too much in the direction of the Sun to be noticeable. On the 24th Neptune will also be passed in the daytime.

For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S., add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhat about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

A Cross in this space is a reminder that your Subscription to the Journal expires with this number.

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QUEENSLAND AGRICULTURAL JOURNAL

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Event and Comment.

The Current Issue.

CONTINUING his interesting review of the development of the sugar industry in Queensland since federation, Mr. Easterby tells the story of the establishment of the Central Mills at Babinda and South Johnstone. The second instalment of Mr. Currie's account of the Brown Cutworm, together with two fine plates in colour by Mr. Helmsing, are in this issue. Mr. McGrath discusses the position and the conditions of the dairying industry in this State, and reminds us of its national importance at the present time. Mr. George Williams has a note on some manurial experiments with pineapples. Mr. Rudd has an informative article on Contagious Abortion; while Mr. Shelton gives an account of the activities at the recent Winter School for Pig Farmers. Mr. Wells's report on the work of the Callide Cotton Research Station, in an abridged form, is also published. The recent tour of a party of New Zealand farmers through a portion of South-eastern Queensland is described briefly. Some points in rural domestic economy are discussed by Mr. Bosworth, of the Queensland Agricultural College. Notes on the care of calves are supplied for the information of the young farmer. The Home and Garden section also contains a budget of topical and useful information. Taken all round the August Journal covers a wide range of matter of interest to all engaged in our basic industries.

The Governor's Speech.

SOME interesting references to rural industries were made by His Excellency the Governor, Lieutenant-General Sir John Goodwin, when opening the second session of the twenty-fifth Queensland Parliament. Referring to the measures of biological control of the prickly-pear pest, he said that so gratifying had been the success which had attended the administration of the prickly-pear lands of the State that the expenditure of the Prickly-pear Land Commission might now be considerably reduced. The present law made provision for an annual vote of £100,000 for the work of the commission. As that amount would not be required in future, a Bill would be introduced to reduce the amount to anticipated requirements.

Pear-destroying insects had done remarkable work, large areas once densely infested with pear being nearly cleared. To such an extent was that the case that notice of resumption for agricultural and mixed farming settlement purposes,

under the Prickly-pear Land Acts, had already been given in respect of thirty-three prickly-pear leases near Chinchilla, while similar action was being considered with regard to other prickly-pear leases comprising agricultural lands in close proximity to railways.

Forestry Problems.

HIS Excellency added that the forestry problems of Queensland had received very close attention. The rapid increase of importations of timbers had reacted heavily against the native forest and timber industries, whose operations had been at low ebb during the year. With a view to alleviating the situation, substantial rebates in the price of raw material from the State's forests had been made, and the assistance of the Federal Government towards safeguarding our timber industries against the dumping of cheap timber into the State had been sought.

The forest service through its prolonged experimental silviculture had demonstrated that valuable timber species could be reproduced in commercial plantations—a realisation not previously attained by any other country in the Southern Hemisphere—and silvicultural research abroad by specialists of the Queensland Forest Service substantiated the expectations of the Forestry Board in that regard.

Research into the problem of wood-taint in butter had been conducted with satisfactory results for Queensland pine, and investigations were being pursued into local shipworm-resistant timbers for use in wharfing.

Water Supply.

REFERRING to work in connection with water supplies, the Governor said that the Inkerman irrigation area had made further progress and there are now 198 farms, aggregating 6,000 acres, under irrigation. The value of irrigation for sugar-cane production could be judged by the fact that last season the average at Inkerman was 27 tons to the acre compared with an average of 18 tons for the State.

The artesian boring branch of the Irrigation Department was chiefly engaged during the year on the construction of trust bores. Whynot bore, which is situated on the Grey Range near Quilpie, was sunk to a depth of 3,290 feet, and an artesian flow of 925,000 gallons per day was obtained. This bore will serve approximately 130,000 acres of leasehold land, and the water will travel 66 miles of drains.

The Sugar Industry.

MENTIONING matters in connection with the sugar situation in Queensland, the Governor stated that the quantity of raw sugar manufactured in Queensland last season—503,000 tons—was the second largest in the history of the State, being only 3,000 tons below the record output of the previous season. Exports totalled 197,000 tons, the average return to the producer for the total output being £20 5s. 10d. per ton compared with £20 17s. 11d. for the previous season. Present indications point to the yield of Queensland sugar for the current season being in the vicinity of 480,000 tons. Hopes were entertained that the forthcoming Imperial Conference would be able to arrive at an arrangement which would secure the retention of the reciprocal benefits of inter-Empire trade.

An Excellent Season—Crop Extension.

HIS Excellency, in referring to other rural activities, remarked that in the agricultural districts an excellent season had been experienced. There had been an increase of at least 15 per cent. in the volume of wheat production.

Satisfactory reports had been received respecting this year's tobacco crop at the Mareeba Tobacco Experiment Station. The Commonwealth Tobacco Investigations Committee, working in conjunction with State authorities, had extended exploratory plots into Central Queensland. It was proposed during the coming season to extend tobacco experimental work in Southern Queensland. Data published by the Council for Scientific and Industrial Research showed conclusively that Queensland had a promising future for the production of high-class smoking tobacco.

The cotton crop for the present season was expected to be substantially larger than the preceding one. Important developments in the cotton-growing industry of the State had also marked that period, and through the efforts of the Government the cotton-growers now operate their own ginneries and oil-mills.

Favourable seasonal conditions during the past year were reflected in the output of dairy produce, which reached a new record of over 76,000,000 lb. of butter and over 15,000,000 lb. of cheese.

The Passing of Mr. Pritchard.

THE death of George Henry Pritchard removed recently one of the ablest and hardest fighters for economic rights that the sugar industry in Queensland has had in the course of its long and eventful history. To meet Harry Pritchard, in friendly or hostile conference, was to meet a man ready to fight all the way, and to fight keenly, cleanly, and with all the force of a dynamic personality endowed with rare perception and appreciation of the facts of the case, in any cause that he espoused. With him as an advocate whether in court, conference, or the Press, the industry was well served. The best part of his life was spent in waging the battles of the sugar-growers in any field into which they were taken. As an authority on sugar organisation and legislation he was recognised by all sections of the industry. His early banking training stood to him well in the wider commercial world, and his grip of every phase of the industry, in all its altering circumstances, enabled him to set a course, as events demanded, with sanity and sagacity and success. His helmsmanship in the industry was marked by strength of mind and character that won him the respect even of "his friends the enemy," who paid willing and generous tribute to the high qualities, personal and otherwise, that he possessed. His passing is sincerely regretted not only by sugar producers, but by all interested in the things that matter in this young Commonwealth, as well as by those who knew him, and having known him appreciate the value of his devotion to the industry and the State he served so well.

The Dairy Industry—The Need of Scientific Research

THE urgent need of initiating investigations into Australian dairying problems has been pressed on the Commonwealth Council for Scientific Research. On examining the request, it became obvious to the Council that a considerable diversity of opinion existed as to the lines such an inquiry should follow. The Council therefore determined to seek further information before taking definite action. From a preliminary investigation, undertaken by Professor S. M. Wadham, of the University of Melbourne, much useful information has been obtained. His report is now before us, but in making it generally available the Council indicates that such action does not mean that opinions expressed by the investigator are necessarily its adopted views, nor that it is intended to follow in their entirety the recommendations made. Professor Wadham covered a wide economic range, right from the pasture to the pantry, in the course of a brief though comprehensive review. His general conclusions and recommendations are worth the attention of everyone engaged in the dairying industry. On the economic aspect, he says that no matter how much money and effort are spent on the scientific side of an industry, such outlay will be largely in vain if the organisation of that industry is unsound. Of these economic inquiries, the first is that of land tenure—this is a regional trouble, not very old in Australia; it will spread unless it is checked at an early date. The specific information required is the extent and conditions of short term land-tenure systems in the dairying districts of Australia and their influence on dairy production as far as it can be estimated. The next point is the distribution of dairy factories in districts with reference to overhead costs of manufacture, costs of transportation, and the natural limitations preventing the regrouping of factories. The last economic problem is a survey of the overseas market and the factors operating thereon. If the Commonwealth is to have an economics bureau, he believes, the first two of these should be well within its sphere of action. The co-operation of State Departments would, no doubt, be obtained. It is possible that the Department of Markets could undertake the third, or it may actually have the information at the present time.

On the production side, his opinion is that the industry needs assistance in six directions. As to veterinary and nutritional problems, these have already been reported on to the Council. As to pasture and pasture management, it is understood that plant introduction is already receiving attention from the Council's Division of Economic Botany. A broad pasture survey of the various dairy districts in the Commonwealth, coupled with carefully devised schemes of experimentation on management and manuring, will lead to satisfactory results. The field is vast; if the Council can provide additional agrostologists for the task, so much the better.

As to herd testing and the encouragement of the use of high-grade stock, these are matters which can be treated adequately by State Departments. The importance to the industry of subsidiary products, such as pig-raising, is great and requires careful study. It is in some ways a local problem and, requiring extensive areas and buildings, must remain a matter for State organisation. Professor Wadham also discusses educational and technical matters, and all his recommendations as to the training of factory operatives, technical control, and continuous research are worthy of every consideration.

THE QUEENSLAND SUGAR INDUSTRY.

By H. T. EASTERBY, Director, Bureau of Sugar Experiment Stations.

PART VIII.

(b) Review of the Industry since Federation.

(Continued.)

WE may now proceed to the establishment of the Central Mills of Babinda and South Johnstone, as they were the outcome of the Report of the Royal Commission which was appointed late in 1910 but did not take the bulk of its evidence till 1911. This Commission was appointed by the State Government to inquire into and report upon the following matters relating to the sugar industry, i.e.:—

(1) Is it desirable that the Government should establish more Central Sugar Mills?

(2) If so, how many and where?

(3) What conditions should be imposed on advances to be made for the erection of such mills?

The Commission consisted of Messrs. R. A. Ranking, Police Magistrate, J. R. Paddle, and Dr. A. J. Gibson.

Applications for the establishment of Central Mills had been received by the Government from Babinda (Russell River), Bailey Creek and Daintree River, Daradgee (North Branch of Johnstone River), Freshwater (Cairns), Liverpool Creek, Tully River, Rockhampton, and Gympie and later on instructions were sent to visit Aloomba (Cairns), South Johnstone, Mourilyan Syndicate lands, Long Pocket (Ingham), Hamilton, Kelvin Grove, Silent Grove (Mackay), and Yeppoon (Rockhampton). After visiting the various sites proposed for Central Mills and hearing a large amount of evidence, the Commission recommended—

(*a*) That it was desirable that the Queensland Government should establish more Central Mills.

(*b*) In connection with the question of how many new mills should be built the Commission took into consideration the then milling power of the existing mills, the importation of foreign sugar and the possible increase in population. They pointed out that the average annual production for the years 1902-1909, inclusive, amounted to about 160,000 tons, and that the average annual imports of foreign sugar for home consumption for the years 1901-1910, inclusive, amounted to 46,306 tons, and they took this import of 46,306 tons as the actual average annual shortage as between production and consumption. They considered that the increase in population would indicate an increased demand of approximately 3,500 tons of sugar per annum. At the same time expansion in the existing mills and the possible erection of mills by private enterprise was not lost sight of, nor the fact of variable seasons, although this factor to-day with the much greater production north of Townsville is not of so much importance.

Allowing for such factors the Commission recommended that two mills should be erected for the crushing season of 1913 and one for the year 1914, and that the consideration of the erection of additional mills

be thereafter reviewed as necessity arose and in the light of their final recommendations as to sites. After reviewing the different sites inspected, the Commission recommended that the two mills to be erected for 1913 should be one of 10,000 tons and one of 5,000 tons sugar capacity. The larger of these mills should be erected at Babinda Creek, Russell River, and the smaller mill at Daradgee, Johnstone River.

In considering the proposal to erect a mill at Jarvisfield, near Ayr, the Commission reported favourably, but Mr. J. Drysdale, of the Pioneer Mill, in giving evidence stated a verbal agreement between himself and the Government existed whereby he was to erect a mill on the Inkerman Estate, and he further stated that he intended building this mill, not only to met the requirements of the Inkerman lands but to take surplus cane from the Pioneer and Kalamia mills. The Commission therefore recommended that if before 31st December, 1911, no definite assurance had been received by the Government that a sugar-mill was to be established at Inkerman, the number of mills to be erected for the 1913 season should be three, the third mill of 5,000 tons capacity to be built at Jarvisfield, Burdekin River.

Continuing with their recommendations the Commission advised that for the season 1914 a mill of 8,000 tons sugar capacity be erected on the south branch of the Johnstone River, and that the subject of the further erection of central mills should be allowed to remain open to review by the Treasurer from time to time. If further new mills were decided upon, the Commission put the sites for same in the following order:—

> Freshwater (Cairns), Liverpool Creek, Tully River, Long Pocket (Ingham), Bailey Creek, Hamilton (Mackay), Silent Grove (Mackay), Aloomba (Cairns), and Don River (Bowen).

The Commission further recommended under the provisions of "*The Licensing Act of* 1885," section 22, the prohibition of the issue of new licenses for the sale of liquor within the area for proposed new mills.

The outcome of the Commission's Report was the passing of an Act in October, 1911, to authorise the construction and establishment of sugar works by means of moneys advanced by the State and to provide for the repayment of such moneys, and for the maintenance, management, and control of such sugar works and for other purposes connected therewith. This Act was known as "*The Sugar Works Act of* 1911," and it was under this Act that the Babinda and South Johnstone sugar-mills were erected by the Queensland Government. The Act provided for a system of Cane Credits, being a percentage of the price paid by the Corporation of the Treasurer to suppliers of cane as the Corporation considered to fairly represent money appropriated towards the repayment to the Treasurer of the loan with interest, and also provided for rates on owners and occupiers of land within a sugar-works area to meet any annual deficiency. The sale of intoxicating liquor in a sugar-works area (i.e., a sugar-works area created under the Act) was declared to be unlawful.

The recommendation that two mills be erected for 1913 was not carried out in that year. The Daradgee proposition eventually dropped out. Messrs. Drysdale Brothers, however, erected the Inkerman Sugar Mill in 1913-14, and its first crushing took place in 1914 with a crop of 62,052 tons of cane. Due to the severe drought in the Lower Burdekin district in 1915 the Inkerman Mill did not crush that season.

In 1913 the Cairns-Babinda supporters of the mill project were getting restive. A number of growers had opened up land at Babinda and were already growing cane. From the Babinda area about that time growers representing some 480 acres were sending their cane to Mulgrave, and those representing 1,017 acres were forwarding cane to the Colonial Sugar Refining Company's mill at Hambledon. There were also areas that had been planted which were too far from Mulgrave and Hambledon to render the harvesting profitable, and in addition a number of small areas were under cane for the purpose of providing plants. Arrangements were made in April of 1913 by the Premier, Mr. Denham, to visit Babinda, where he met the Provisional Committee and a large number of those interested in the project. Most impassioned speeches were made, notably by the late A. J. Draper and G. R. Mayers, and also by Dr. Reed, who were all at that time considerably interested in the Babinda lands. Certain statements had been laid before the Government before the meeting took place, and the Premier stated that if the evidence as to areas, &c., were substantiated the next step would be to call tenders for the erection of the mill. The duty of verifying the statements was put in the hands of the writer who, with Mr. R. Wilson, now Assistant Under Secretary to the Department of Agriculture and Stock, rode around the lands interviewing the canegrowers, and the facts elicited were that the estimated area under cane closely approximated that set out by the Provisional Committee.

Later in the year tenders were called for the erection of the Babinda Mill, the successful contractors being Messrs. George Fletcher and Company, of Derby, United Kingdom. During 1914 the land was cleared for the mill site and the building partly erected, it being intended to commence crushing in 1915.

Tenders were also called for the sister mill to be erected in the South Johnstone area, and the same firm were successful in getting this contract also. This mill was to be ready to crush in 1916. Scrub clearing was commenced and farms were being taken up for the opening of the mill.

The Babinda Mill was ready for crushing during the 1915 season and got to work, although it was not finished by the date set out in the contract. This was due principally to the war and the difficulty of procuring materials necessary for the completion of the works. It was a very dry season in 1915 and there were numerous cane fires which, according to one exaggerated statement, boiled all the fish in the Russell River, but which did considerably hamper manufacture, and there were at times serious delays owing to accidents to the machinery, so that serious deterioration in the cane set in before it could be treated. As the season progressed, however, many difficulties were overcome. The first crop was naturally a small one, amounting to only 47,014 tons of cane. The sugar manufactured at 94 n.t. being 5,209 tons. The following year, 1916, however, saw much improved conditions all round, and Babinda's crop was 154,630 tons, and since that date it has always had large tonnages of cane to deal with. The contractors did not hand over the mill till after the completion of the first crushing. Meantime, the erection of the South Johnstone Central Mill had been commenced and was being proceeded with in 1915. At the end of the year owing to the war the delivery of machinery was delayed and progress much retarded. It was, however, hoped that the mill would be equipped and ready to commence crushing about the end of September, 1916. The tramway work at South Johnstone was of very solid character, caused by the country through which it was necessary to go for cane.

Plate 48.—Babinda Central Sugar Mill.

The mill was due to be completed in July, 1916, but it was not complete in October of that year. A start was made at the end of October and a crop of 56,205 tons of cane was put through the rollers. A good deal of the sugar introduced could not be recovered owing to the requisite appliances not being available, and the financial loss caused thereby was considerable. It was recognised, however, that the farmers were not responsible for the war conditions and that their crops must be removed. The crushing did not terminate till February of 1917 when 4,653 tons of 94 n.t. sugar had been manufactured. It took 12·07 tons of cane to make one ton of sugar. Next year, 1917, the crop was 81,584 tons. A loss was made on the first two seasons' operations, which naturally created much anxiety. Unfortunately, the following year (1918) a disastrous cyclone caused great damage to this mill, not only were buildings wrecked but there was loss of life and the farmers suffered severely, houses as well as crops being more or less damaged. In consequence, the tonnage of cane fell this year to 57,106 tons. The outlook at South Johnstone therefore in the early years of its history was most distressing, but in a few years the difficulties were surmounted and big crops have been handled during recent years. The erected of these two mills had a wonderful effect in opening up unpopulated country. Where impenetrable jungle once reigned there are now mills, townships, farm houses, schools, hospitals, libraries, post offices, telephone exchanges, and railways—in fact all the adjuncts of civilisation.

In a history of this kind it is necesary after following out different lines of activities to have to return to a previous period. We may therefore go back to 1912 when the first Federal Royal Commission concluded its sittings and presented its report. This was the most voluminous document ever printed in connection with the Australian sugar industry. Evidence was taken from 447 persons, and the printed volume ran into 1,146 foolscap pages. The findings were not quite unanimous, four of the members presenting a majority report, while a dissentient memorandum was furnished by Mr. T. Crawford, one of the members. The reference to the Commission embraced the following subjects:—

(*a*) Growers of sugar and beet;
(*b*) Manufacturers of raw and refined sugar;
(*c*) Workers employed in the sugar industry;
(*d*) Purchasers and consumers of sugar;
(*e*) Costs, profits, wages, and prices;
(*f*) The operations of the existing laws of the Commonwealth affecting the sugar industry; and
(*g*) Any Commonwealth legislation relating to the sugar industry which the Commission thinks expedient.

The Chairman of the Commission was first Sir John Gordon, and on his retirement through ill-health William Jethro Brown. The other members were Albert Hinchcliffe, M.L.C., R. M'C. Anderson, M. R. M. Shannon, and T. W. Crawford. The Commission entered on its duties on 25th October, 1911, held 139 sittings, and presented its report in December, 1912. In the conduct of their investigations and in the framing of their report they assumed:—

(1) A loyal adherence to the policy of a "White" Australia.
(2) The natural importance from the point of view of defence of effecting the settlement and cultivation of the tropical and semi-tropical areas of the Australian continent.

Plate 49.—South Johnstone Central Sugar Mill.

The Commission served a highly useful purpose, and its report was read with intense interest. They took a far-seeing view and to some extent dispelled the clouds of ignorance and prejudice obscuring this important industry; they showed that it was one of national importance, the maintenance of which vitally affected every citizen of the Commonwealth. By no other means could our vast littoral be peopled and defended. The following extracts from their report are worth quoting and are just as vitally applicable to-day:—

> "While the wide divergencies of opinion which exist to-day with respect to the relation of public control to the sugar industry are often the result of mere ignorance of essential data, they are still more frequently the result of the failure to out-grow ideas, opinions, or policies which belong to the limited outlook of pre-Federal times. The problem of the sugar industry to-day is not, save in subordinate respects, a problem of industry, of wealth, or of production; it is primarily and essentially a problem of settlement and defence. No nation can afford to regard lightly the development of its industries, the progres of its wealth, or the economic efficiency of its productive machinery. But, important as these things undoubtedly are, they rank, as regard the sugar industry, on an inferior plane. The Commonweatlh to-day is brought face to face with one of the gravest problems which has ever taxed the ingenuity of statesmanship—that of the settlement of tropical and semi-tropical areas by a white population living under standard conditions of life. And, intimately associated with this problem is the question of national defence. If the ideal of a "White" Australia is to become an enduring actuality some means must be discovered of establishing industries within the tropical regions. So long as these regions are unoccupied, they are an invitation to invasion as well as a source of strategic weakness. Granted so much, it follows that the supreme justification for the protection of the sugar industry is the part that the industry has contributed, and will, as we hope, continue to contribute to the problems of the settlement and defence of the Northern portion of the Australian continent. The recognition of the nature of this supreme justification is the first condition of a sound public policy in relation to the sugar industry. Relatively to it all other issues are of minor importance."

The Commission recognised at that date the possibility of effective settlement by a white population of the Queensland coastal areas. They believed the opposition shown was due to a failure to recognise the physical adaptibility of the white races to varying climatic conditions.

It is not intended to follow the report of the Commission in detail as at the present time many of the questions which were then of importance have been settled or are no longer of any great interest. It was a capable Commission and the industry owes a debt of gratitude to it for its presentation of the facts.

During 1912 the Department of Agriculture sent the late Mr. T. H. Wells to New Guinea to collect sugar-cane varieties, and 158 were forwarded to the Mackay Sugar Experiment Station. Those were secured by Mr. Wells in the face of considerable difficulties from the mountainous regions of Papua. Unfortunately, after long trials, none of those varieties were found to be as good as three or four of the earlier collection by Mr. H. Tryon, though Mr. Wells was not responsible for this, as he had no way of testing canes but simply chose them on appearance.

[TO BE CONTINUED.]

Bureau of Sugar Experiment Stations.

FIELD DAYS.

It has been the policy of the Bureau of Sugar Experiment Stations for many years past, to conduct Annual Field Days at each of the Experiment Stations, at South Johnstone, Mackay, and Bundaberg. In this way it has been possible to bring before the notice of attending growers and others interested in the industry the nature of the work which the Bureau is undertaking, and a demonstration of the results obtained.

Whilst realising the shortcomings of this field day system, the policy was continued until last year, but it has now been decided that the Experiment Station field days shall be discontinued. This may possibly meet with disfavour from sections of canegrowers who were happily situated with respect to an Experiment Station, but it is felt that a careful consideration of the plan which will be substituted for the old one, will go further towards the achievement of the full aim and object of a field day, and will exceed in usefulness and popularity those hitherto conducted at the Stations.

The interest shown in our annual gatherings of the past is evidenced by the numbers attending these functions. Last year, record numbers attended field days at all three Stations, and at Mackay the number present approximated 1,000. The difficulties which attend the efforts of the Bureau officers in their attempt to address such large gatherings, or to meet individual growers is very evident. For this reason it is desirable that the numbers attending a group field day should be greatly reduced, and the plan must be to increase the number of field days, and meet smaller groups of growers on each occasion. The Bureau will hold, then, district field days—a district consisting of the area supplying cane to one mill, or of an area which produces portions of the crop of several mills, but where soil and general agricultural conditions are similar.

The inauguration of such a scheme has been made possible by the recent addition to the personnel of the agricultural staff of the Bureau, and the decentralisation of the experimental work which is rapidly being pushed ahead. Last year marked the institution of extensive farm experimental trials, to determine the effects of fertiliser treatments, to compare the relative values of a series of cane varieties, or the resistance of new and old varieties to major cane diseases. These plots have been set out over a wide range of soil and climatic conditions, and each year their numbers will be increased.

The results gathered from these tests should be of greater direct value to growers than the results of Station experiments; for they are performed under farm conditions, on soils representative of the types on which the results will be applied directly. It is obviously futile for a grower to visit, say, the Bundaberg Station, study the fertiliser response there, and hope to obtain similar results from identical treatments on, say, the alluvial soils of the Maroochy, or even the Burnett River. Similar remarks will apply to methods of land preparation and cultivation; for a different set of conditions might render the methods employed on one soil type, under its peculiar climatic conditions, totally unsuited to a different type with its attendant problems.

Field days will, then, be conducted along lines somewhat similar to those which were followed at Bli Bli (Nambour) last year. This field day was conducted by the local farmers' committee, and the success of the project was such that the event is to be repeated enthusiastically a few weeks hence.

A plan which might prove suitable for a mill district field day would be along the following lines:—The local committee (or executive) would fix a day which is agreeable to the majority of growers, as well as the place of assembly. Officers of the Bureau representing the various agricultural divisions would be in attendance, and proceed with the party over a carefully arranged itinerary. It might be thought desirable to make a tour of inspection of fertility or varietal trials located within the mill area, and the points of value which are evidenced by the different treatments (or varieties) discussed. The extent to which the results of the trial are applicable throughout the area might be emphasised and the limitation of their application also stressed.

A practical study of the soil type from the point of view of its cultivation needs and physical peculiarities could be undertaken profitably. On an agreed farm a demonstration of suitable and improved implements could be arranged with the manufacturers and distributors of farm implements, in the same way as they have been at the Stations in the past.

Addresses on the important cane diseases and pests might also be given by the Bureau's officers. In districts favourably situated with respect to Experiment Stations, the latter might be visited if there be any demonstration of value to be seen. The smaller number of growers in the party will make it possible to encourage discussions on the various points raised, regarding all phases of agricultural work, and the personal touch between the grower and the officers will be fostered.

The advantages attending such a field day will be evident. It provides an opportunity for the officers to meet growers under their own conditions, and discuss with them their problems and the methods by which their difficulties may be met. It may not be possible to arrange field days of this nature during this year, but the wishes of growers will be met, as far as possible, in this respect. Farmers may rest assured that the officers of the Bureau will do their part in making the function one of value and interest.

In conclusion, it should be clearly understood that this is not an attempt to keep interested growers from visiting the Experiment Stations. On the contrary, visits will be welcomed from all interested in the work, either individually or in groups, and the Bureau takes this opportunity of inviting more growers to visit the Stations, when the officers will be ever ready to conduct them around and give information on subjects of interest.

CANE PESTS AND DISEASES.

The Director of Sugar Experimental Stations, Mr. H. T. Easterby, has received the following report (24th July, 1930) from Mr. J. H. Buzacott, Assistant Entomologist:—

NOTES ON THE GIANT TERMITE.

A period of five weeks spent in the Burdekin district during May and June this year disclosed some interesting facts relative to the life-history of the Giant Termite, *Mastotermes darwiniensis* Frogg.

A great number of stumps and logs infested by the pest were examined, and finally the search was rewarded in the finding of quantities of eggs. These eggs were discovered in a rotten stump, which, on being pushed, broke off level with the ground, and proved to contain almost a solid mass of termites. At ground level where the fracture occurred, there were seen attached to the earthy matrix of the internal nest, numerous groups of brown eggs, and one individual termite somewhat larger than the normal worker and quite distinct in that it was of a rich dark-brown colour with a creamy-yellow venter. This termite appeared to be actually ovipositing when first observed, but it is not possible to say definitely that it was, and although kept alive in a tin for nearly a fortnight it never oviposited therein. Thus the actual laying of the eggs still remains somewhat obscure, although it seems possible that they may be laid by a modified type of worker such as that described, particularly as Mastotermes is known to be a primitive genus.

The eggs are elongate, about .05 inch in length, of a uniform brown colour, and attached by one pole in groups of twelve to twenty-four. The units in each group appear usually to be arranged in two parallel rows and are bound together throughout their length by some sticky substance, which seems to be provided from the mouth of the worker. On the nest being opened, the workers immediately proceed to carry away the egg masses and reattach them to the nest matrix in a more secluded tunnel of the nest. On hatching from the egg, the young feed on fungi growing on the matrix where the eggs are deposited until they are capable of going out to forage with the adults.

In a nest of Mastotermes the following types can be seen:—Workers (one caste), soldiers (one caste), alate forms (winged), and nymphs of the three types. During May, however, neither alate individuals nor their nymphs showing wing pads are present. In August the latter are to be found, but the fully developed wing-bearers do not appear till October, and they usually fly in December or January. The number of soldiers present is always small compared with those occurring in other species, and although moderately agressive, the soldier does not rush to the spot when an attack is made on the nest like those of Eutermes and other species do. The soldier is provided with powerful mandibles which it is not slow to use, and, on breaking a nest, soldiers will sometimes be observed carrying the young nymphs away in their mandibles.

It is a common practice among termites to eat the bodies of their dead, and this fact is the keynote of success in using arsenicals or stomach poisons as a means of destroying nests. As far as can be determined this does not take place in Mastotermes. The dead bodies of their fellows will be collected and carried to a

disused tunnel and there left in a heap to become covered with mould. Whether the termites make any use of the mould which freely flourishes in the burial grounds is hard to state.

There are several insects which are always found in the nests of Mastotermes. The larva of a small slate-grey moth, huge larvæ of the scarabæid Xylotrupes and other smaller scarabæid grubs are found feeding on the earth and digested wood matrix of the colony. A small silver fish is common, and large centipedes and millipedes often found, the centipedes feeding on the inmates of the nest.

Many species of ants are predaceous on the termites, and if a nest be broken open most of the denizens are quickly carried off by ants, particularly *Iridomyrmex* and *Camponotus*, although several smaller genera, *Pheidole*, for instance, also do good work.

A nest may not extend more than a few inches into the ground or it may go down for several feet, and from the nest small galleries radiate through which the insects communicate with such food as small trees, sugar-cane, or other growing crops, which may be several chains away from the nest. The termites enter the cane or plant by a small hole and eat out the contents of the stick, leaving only the thin rind without external evidence of injury, until the growing point of the plant is reached, when the heart leaves die.

Practically all timbers are subject to attack by Mastotermes, but some are more resistant than others, and chief of these is Gidgee, which, on that account, is much in demand for fence posts in the Burdekin district. Leichhardt, Moreton Bay Ash, and the Black Palm are particularly susceptible, even whilst growing, to attack.

Recommended Methods of Control.

At the outset it should be stated that *Mastotermes darwiniensis* is far more difficult to control than the smaller species of termites. One of the chief reasons for this is that it does not show any sign of a mound or termitarium above ground where it nests, and every post, stump, or even tree may possibly harbour a colony. There is no means of telling without actually digging whether a tree or stump which is attacked actually harbours a nest or is communicated with from a nest located perhaps several chains away. Another factor which renders them difficult to exterminate is the fact referred to above that they appear non-cannibalistic in habit, thus greatly reducing the value of arsenical poisons as a measure of control.

With regard to buildings, posts set in concrete coming above the surface of the ground and watched to see that the termites do not build a communication gallery over the surface of the concrete is probably the best method to secure against attack. If this is impracticable, all timber used should be coated with a repellent such as creosote oil, or soaked in a 10 per cent. solution of sodium arsenite. If these are not obtainable, then timber soaked in or painted with crank-case drainings from the car or tractor, in which a little arsenic has been dissolved would prove resistant. Wherever a piece of boarding is removed on account of termite attack, the replacing board should be treated as mentioned above, and if the attacked timber cannot be removed, bore some holes into it and squirt in some of the arsenic in oil solution mentioned before.

Sugar-cane plantations suffering damage should first try and clear all timber, stumps, and logs as far as possible from the farm. It should be borne in mind that the termite probably only visits the cane for water. This is borne out by the fact that sugar-cane is always far worse attacked in dry seasons, but at the same time although a certain amount of moisture is necessary, yet an excess of water is one of the best methods of repelling the termite, and further reference will be made to this shortly. Any timber in which a nest is located should be treated by pouring half a pint of carbon bisulphide or a couple of pints of benzine into it and blocking all openings. This treatment will kill most of the inmates of the nest, and if carried out systematically will greatly lessen the pest. Baits consisting of arsenic and molasses in the proportion of 1 lb. to 50 lb. may be poured into nests and are successful, but this treatment should be varied, as after a while the termites seem to get cunning and will not take the baits.

Fence posts are very frequently the source of infection of a farm, and, where possible, the substitution of steel posts as supplied by some Southern firms would be profitable. If wooden posts must be used and Gidgee cannot be obtained, then they should be soaked in 10 per cent. sodium arsenite solution and well creosoted or tarred before putting in the ground.

As regards the cane itself, nothing is more effective than frequent heavy watering of the cane, a course which is quite practicable in the Burdekin district where irrigation is universal. This method of control has been found most effective in

controlling certain South African termites which ravage plantations, and has also been found to give good results in Queensland. Usually one side or a corner of a block shows heavier damage than the rest of the block, and when this is the case a furrow could be ploughed along the headland between the cane and its source of infestation, and in this furrow a bait consisting of bran or sawdust mixed with a little molasses or treacle and water into a mash and then some white arsenic stirred into it should be distributed, and the furrow covered over. Approximately, 1 lb. of the poison is required for 50 lb. of bait. Cane sticks containing termites should be treated with one of the above baits, by breaking off the top of the stick and pouring some of the bait down the tube disclosed.

Planting should be carried out with the ground as moist as possible, or it should be well watered after planting in order to keep the termites from attacking the young shoots, and thus causing a bad strike. Nests may be destroyed if no fumigants are available by well breaking into them, thus allowing access for their enemies, the ants, which will quickly carry off every exposed termite.

In conclusion, the termite or "White Ant," *Mastotermes darwiniensis* Fr., although not presenting a major problem like the cane grub, is steadily spreading, and even if not becoming more intense, it is affecting more farms than a few years ago. It is far better for growers to make an organised effort to control a pest while it still remains fairly easily controllable, than to let it increase its depredations until eventually it reaches such numbers as to require a great deal of time, labour, and money to eradicate it.

CANE PEST COMBAT AND CONTROL.

The Director of the Bureau of Sugar Experiment Stations, Mr. H. T. Easterby, has received the following Special Report, dealing with experimental work carried out during the period May to June, 1930, against insects of the genus Pseudococcus; and which deals with the discovery of a cheap and effective method of combating our mealy bug of sugar-cane, from the Entomologist at Meringa, Mr. E. Jarvis.

A NEW AND EFFECTIVE SPRAY FOR MEALY BUGS.

Most canegrowers and other agriculturists have experienced the persistent aggressiveness of these small, soft-bodied, pinkish insects which are dusted over or covered more or less thickly with white powder or flocculent filaments of a waxy nature. Being gregarious in habit they are usually met with in small colonies, consisting of from fifty to hundreds or thousands of individuals of all sizes, from the tiny larval to adult forms, the latter being generally less than one-eighth of an inch long. In the Cairns district mealy bugs commonly infest the granadilla, passion fruit, and many other creepers, proving particularly obnoxious also to such ornamental shrubs as Acalyphas, Ixoras, Coleus, Crotons, &c. The tropical fruit trees most badly attacked appear to be the Sour-sop and Custard Apples, the fruit being sometimes so grossly infested as to appear white instead of green. (See accompanying plate.)

In canefields these bugs congregate under the older leaf-sheaths in masses, and being thus screened from view their presence usually remains unnoticed.

Notes on Remedial Measures.

Owing to the waxy secretion already alluded to affording a defence against insecticidal sprays, the control of mealy bugs has always proved a somewhat difficult matter; seeing that such protective covering must first be dissolved in order that the bodies of the insects may be thoroughly wetted with the solution used. Moreover, many of the species have an objectionable habit of nestling as far as possible out of sight around the softer shoots and basal portions of the leaf-stalks of affected plants, in positions which can only be reached by the careful application of driving mist-sprays.

Amongst the many different remedies recorded as being more or less effective against insects of the genus *Pseudococcus* the following substances may be mentioned here, viz.:—Kerosene and soap emulsions, resin compounds, carbolic acid, nicotine, lime sulphur, oleic acid, oil emulsions, &c.

Recent experimentation carried out by the present writer at Meringa Sugar Experiment Station has aimed at the discovery of a formula which, in addition to being inexpensive and simple to prepare, shall be composed of materials obtainable at all times from every country store or grocer shop.

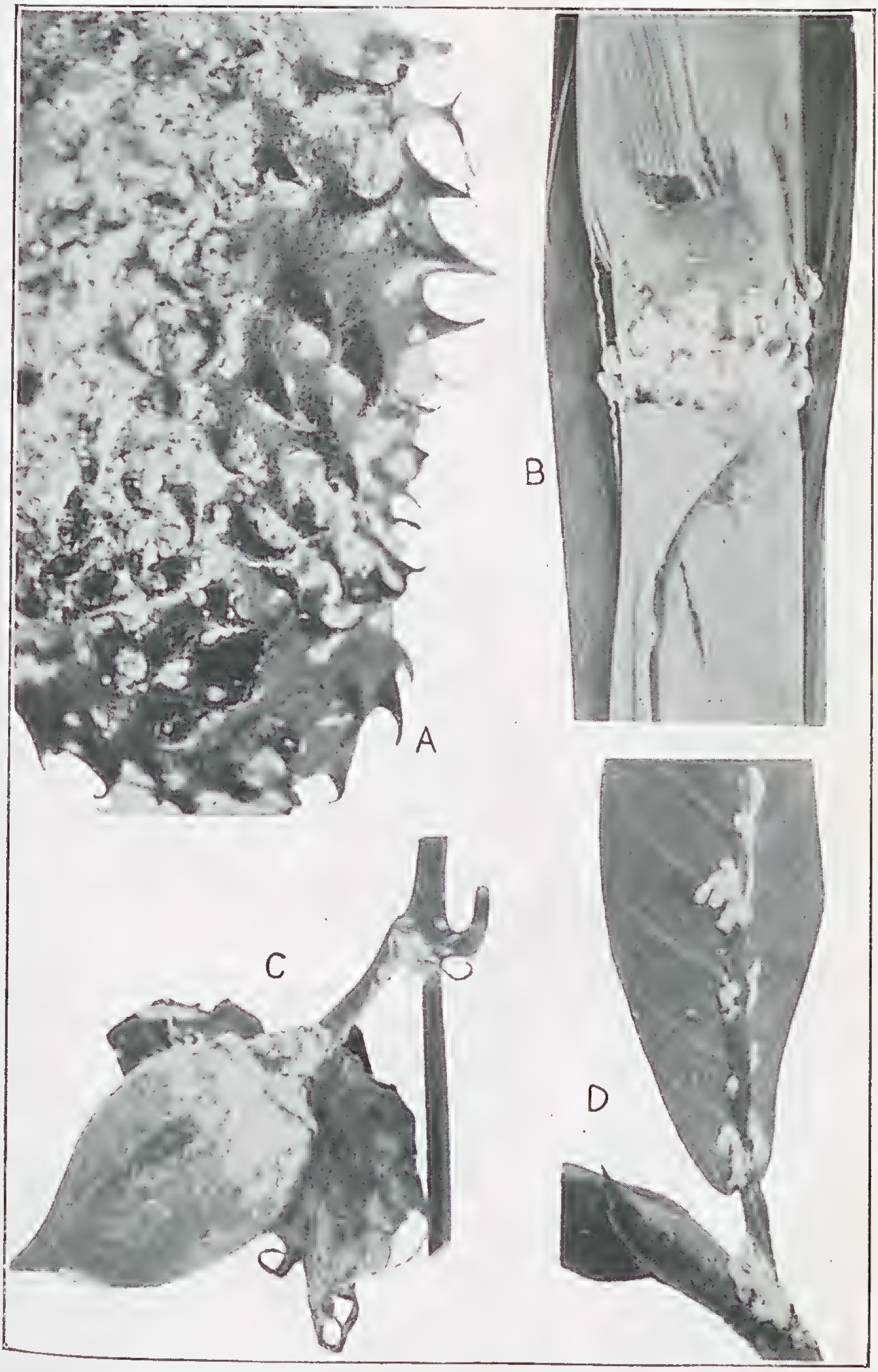


Plate 50.

A. Part of Sour Sop fruit infested by Mealy Bugs. Natural size.
B. Mealy Bugs attacking stick of sugar cane. Natural size.
C. Cotton Boll, infested by Mealy Bugs. Natural size.
D. Mealy Bugs on leaf of *Ficus pilosa*. Natural size.

Attention was accordingly concentrated on such substances as caustic soda, kerosene, soap, resin, and tobacco, used either one with another, or in various combinations; my desire being to make a stock solution of firm consistency, calculated to keep well in the tropics and be always ready for use at a moment's notice.

Preliminary experiments with resin and washing soda compound are proving satisfactory, a soap emulsion containing kerosene and caustic soda was tried and found promising. This latter spray killed about 75 per cent. of adults, 100 per cent. of tiny larvæ, and all eggs that chanced to be fully exposed. Tender foliage was not injured by the solution.

Two different emulsions were then prepared on 21st May, one containing tobacco extract and kerosene, the other crude carbolic and tobacco, in proportions thought likely to combine well. This carbolic acid spray destroyed from 25 to 30 per cent. of adult mealy bugs, together with all the young larval forms; the ants in attendance on them being also killed.

Another emulsion containing caustic soda and kerosene proved fatal to about 95 per cent. of adults, and 100 per cent. of young bugs that chanced to be fully exposed to the spray.

As a result of experiments with the emulsions alluded to above, and a few additional preparations which need not be described here, it was found that maximum mortality was obtained from a combination of soap, kerosene, and tobacco.

This emulsion, which destroys practically 100 per cent. of adults, young, and eggs of this pest, including attendant ants, will now be given in detail below. The table indicates concisely the amounts of material required for making various quantities of the stock-solution.

SIMPLE AND EFFECTIVE SPRAY FOR MEALY BUGS.

Soap "Witch" bar	10 oz.	1¼ lb.	2½ lb.
Kerosene ("Laurel" brand) ..	1 pint	2 pints	2 quarts
Tobacco (black plug)	2 oz.	4 oz.	½ lb.
Rain water	3 pints	3 quarts	1½ galls.
Amount of stock-emulsion	4 pints	4 quarts	2 galls.
Total quantity of spray, if using 6 parts water to 1 part stock-emulsion	3½ galls.	7 galls.	14 galls.

The cost of three gallons of spray solution works out at about 1s. 8d. for material, exclusive of spray-pump or labour, &c. Needless to say, this amount of spray, when applied in mist form, goes a long way.

How to Make the Stock-Emulsion.

Cut 10 oz. of the soap into thin shavings, dissolve same in 2 pints of boiling water and strain through wire gauze. While still very hot pour slowly into this the pint of kerosene, and then the 2 oz. of tobacco extract, stirring all the time. The latter ingredient (the strong, black sort favoured by seamen and our aboriginals) is quickly prepared by tearing the plug into flakes of leaves and stems which are then boiled for about twenty minutes in the other pint of water; the resultant nearly black fluid being then strained while still quite hot through closely woven linen before adding to the kerosene-soap mixture. During cooling of the finished emulsion it must be stirred vigorously for some minutes and then poured from one vessel to another in such manner as to impart a churning motion until lukewarm.

At this stage it starts to thicken and should then be stirred well until ready to pour into tins or jars, as such final agitation ensures a good, uniform emulsification of the tobacco extract. This stock-emulsion sets after a few hours, attaining a consistency resembling that of frozen butter, and being light chocolate in colour. To prepare a spray for immediate use, melt the amount of stock-emulsion required (according to the number of insects to be treated) over a slow fire, and when quite liquified add six parts of water to one part by fluid measurement of the stock emulsion. Allow this to stand on the stove until reaching a temperature of about 50 deg. C. (just hot enough to be able to hold one's finger in). Apply at once, through a nozzle throwing a misty spray with good force, holding end of same within a few inches of the mealy bugs in order to wet them thoroughly.

Always strain the made-up spray when filling your pump, as this will avoid trouble with atomising nozzles.

When heating either the stock-emulsion or spray be careful to see that it does not boil, or even reach a scalding temperature.

The Spray Does Not Injure Plant Life.

During the testing of this emulsion on different species of mealy bugs attacking cane, cotton, figs, Acalyphas, Ipomea, Beaumontia, &c., the various solutions used were always applied at the same time (while quite hot) to leaves of sweet-potato, tomato, passion fruit, strawberry, papaw, and other foliage; as well as to tender seedlings of cabbage, turnip, beetroot, carrot, &c.

It is satisfactory to be able to record that in no cases did such spraying result in material injury to any plants so treated.

The Director of the Bureau of Sugar Experiment Stations, Mr. H. T. Easterby, has received the following report for the period June to July, 1930, *from the Entomologist at Meringa, Mr. E. Jarvis*:—

An Erroneous Impression Contradicted.

Among the various remedial measures against cane grubs investigated during recent years there is one which, although proved conclusively to be worthless, still appears to find advocates among certain farmers in our sugar-growing districts.

It is high time that this old delusion concerning the supposed value of white arsenic as a remedy for cane-grubs was fully exposed, seeing that even at the present time there are growers in the Burdekin and elsewhere who continue to be foolish enough to waste their time by using a method which can only result in disappointment and financial loss.

I wish, therefore, to emphasise the fact that although white arsenic might prove serviceable under field conditions if employed in the form of a poison-bait (see Bulletin No. 4, Div. of Ent. Bur. S. Expt. Stns., 1916), it is quite useless to expect to get beneficial results by merely sprinkling or otherwise burying it amongst the roots of sugar-cane.

Dr. Illingworth commenced his experiments with this arsenical in the year 1918, carrying them on throughout a period of about three years, most of his experiment plots being situated on the Greenhills Estate. Some of the methods of application tried during this period were:—

(1) White arsenic placed in drills on sprouting plants,

(2) White arsenic placed under the stools of cane,

(3) White arsenic placed with the sets.

Negative Results with White Arsenic Against Cane Grubs.

Data filed at our Experiment Station giving results obtained on field plots established at Greenhills by Dr. Illingworth in 1921 (about a couple of months before he left Queensland) show that on 23rd March, at the time of year when grubs were doing the greatest damage, no difference was apparent between plots treated with 100 lb. and those which had received 200 lb. of white arsenic per acre. The cane on Block H2 was found to be uniformly grub-infested, no difference being observable between that which had been treated with this poison and cane in the untreated check plots.

Results obtained by digging up the cane stools on these test plots were as follows:—A stool dug in the 100 lb. arsenic plot yielded seven grubs, while another examined in the untreated check plot alongside gave two grubs. Again, a stool dug up in the 200 lb. arsenic plot yielded thirteen grubs, while another stool on the check plot alongside revealed eleven grubs. Thus, it so happened that a final examination of these experiment plots revealed, curiously enough, the presence of more grubs under the stools which had been treated with white arsenic than chanced to occur on the plot which had been left untreated alongside. No dead grubs were obtained from beneath any of the treated or check stools on this H2 block.

The result of this investigation made at Greenhills on 23rd March showed conclusively that as many grubs occurred under cane on land which had been poisoned at the rate of 100 to 200 lb. of white arsenic per acre, as under cane which had not been treated.

Biological Control Work.

At the present time the life history of one of our rare species of digger wasps named *Scolia formosa* Guer. is being studied. This species was first recorded by the present writer in 1923, who succeeded in breeding a specimen captured at Gordonvale, from which twenty-four eggs were obtained. These were all deposited on grubs of our greyback cane bettle, and ultimately yielded eleven cocoons; the wasp, however, refusing to oviposit on grubs of the small brown cockchafer *Lepidiota frenchi* Blkb.

Scolia formosa is about the size of our common digger wasp *Campsomeris tasmaniensis* Sauss., its black abdomen being ornamented with broad bands of rich orange-red; while the head, thorax, and legs are densely clothed with reddish hairs. The present specimen, which was also captured in a flower garden at Gordonvale, has already laid, to date, thirty-one eggs on grubs of the greyback cockchafer. Data of an interesting nature relative to the effect of changes of temperature on the duration of its various life-cycle stages is being recorded from day to day.

The wasps derived from eggs of this insect, being now obtained here, will be welcome additions to our office collection; especially the male specimens, only one of which was secured from my 1920 breeding of this digger wasp.

Visit to the Lower Burdekin District.

During May and June the Assistant Entomologist, Mr. J. H. Buzacott, paid a visit to Ayr, our principal object being to carry out further investigation regarding the habits, metamorphosis, and various methods of controlling the ravages of the "Giant Termite" (*Mastotermes darwiniensis* Frogg.

In the opinion of Mr. Buzacott, the damage caused by this termite is gradually spreading, although "there does not," he remarks, "appear to be any increase in concentration of the pest. The spread is quite local, and cane is being attacked only on farms which are adjacent to those formerly suffering damage." "Grubs," he reports, "have caused damage on several farms near Ayr and considerable damage at Giru, especially along the banks of the Haughton River. The Burdekin Pest Destruction Board paid out nearly £2,000 for greyback beetles collecting from the feeding trees during the flighting season this year.

"The only other pest causing appreciable damage in the district is the bud moth, *Opogona glycyphaga* Meyr., which is badly damaging the eyes of certain canes. Although this moth is usually quite common it rarely reaches the status of a serious pest, but it was certainly killing sufficient eyes to cause a poor strike, and should warrant investigation."

INSECT FRIENDS OF THE CANEGROWER.

ENTOMOLOGIST'S ADVICE FOR AUGUST.

By EDMUND JARVIS.

While ploughing cane land one constantly unearths and exposes to view various forms of insect life, mostly representive of the commoner species of scarabæidæ, familiarly known as cane beetles.

Although growers are, of course, perfectly aware that these abovementioned grubs should be destroyed as far as possible, they understand very little about the habits of other soil-frequenting insects often occurring in the furrow, some of which, being parasites of cane grubs should always be carefully protected.

Chief of these is a sleek-looking, plump, shining white maggot about an inch in length, which is generally found attached to a dead or dying cane grub. This maggot if left in the soil ultimately spins a cocoon of closely woven silk of a reddish-brown colour and the stiffness of brown paper.

About a couple of months later a handsome wasp parasite emerges from this cocoon and digs it's way to the surface.

Each of these wasps is able to destroy over a hundred grubs, and breeds at the rate of at least four generations a year.

Other friendly insects include the predaceous larva of a skip-jack or elaterid beetle; and the larva or maggot of a common species of "robber-fly," both of which live in the ground and tunnel about in search of various cane grubs.

The former resembles a large flattened wire worm, about 2 to 4 inches long, while the maggot of the robber-fly has a sharply-pointed beak and exceeds an inch in length.

Hints to Field Assistants.

The activities of the Supervisor in our cane fields may be said to embrace a rather wide range of work, calling, as it does, for a practical knowledge of agriculture, combined with an aptitude for experimental research of a scientific nature; together with a dash of originality and plenty of common sense.

Being on the spot, as it were, he can generally get leave from growers to conduct various experiments on their farms, and is always at hand to supervise the carrying out of same. He is also in a good position to suggest any improvements that may chance to occur to him regarding routine methods of farm cultivation which might facilitate the operation of, or render more effective certain lines of control work against cane grubs or other insect pests.

Another important service which could be performed by the Field Supervisor would be the recording of data in connection with cane varieties, insects, pathological diseases, fertilisers, &c., which come under his notice from day to day.

Such details are always of interest, and should be of future assistance to those concerned, or engaged in studying the control of insects and fungus diseases.

In the work of field experiments or plots designed to test the efficiency or otherwise of insecticides or soil-fumigants, the Supervisor has the best possible chance of securing that harmonious co-operation with the farmer concerned, which certainly goes far towards ensuring the carrying through of such experiments in the best manner.

BUREAU OF SUGAR EXPERIMENT STATIONS.

In recent years the Bureau of Sugar Experiment Stations has made considerable advances in the direction of affording more help to growers and millers. With the return of the travelling scholars, Messrs. Kerr, Bell, and Bennett, it was possible to reorganise the work of the Bureau, which is now divided into four sections, viz.:—

1. *Soils and Agriculture.*—This comprises Sugar Experiment Stations in the Southern, Central, and Northern sugar districts, and an extension service employing field officers located throughout the cane areas, who keep in close touch with cane growers. Numerous experiment trials with cane are established in all sugar localities.

2. *Sugar-cane Pathology.*—Officers employed in the field and laboratory are studying cane diseases and their control.

3. *Entomology.*—Entomologists are maintained at selected locations so as to deal effectively with the study and control of the most important cane pests.

4. *Sugar Mill Technology.*—The Technologist and his staff investigates mill problems and the various phases of sugar extraction and manufacture.

The organisation of the Bureau covers the several branches of growth and manufacture in a manner unique amongst the primary industries of Australia. The funds for its maintenance are contributed equally by the industry and the Government.

The Laboratories of the Divisions of Soils, Agriculture, and Pathology are situated at Brisbane and have just been completed. They are thoroughly up to date and include all the latest apparatus for scientific work. Sugar growers and millers visiting Brisbane are especially invited to call and see the work being carried out in these laboratories, which are situated in the Department of Agriculture's building, in William street. Here investigations and research work in chemistry and physics of our sugar-cane soils, and into the diseases of cane, are being conducted.

New laboratories have also been fitted up at the Mackay Sugar Experiment Station for the work of sugar mill technology. It is hoped to give the mills a considerable amount of scientific assistance in the future, and to help to solve some of their many problems.

The work of the recently formed Queensland Society of Sugar-cane Technologists, it is anticipated, will also have a great effect in improving the sugar industry, and bring it more in line with the world's best practices.

So far from having to increase the levy on sugar mills and growers for the carrying out of this new work and the enlargement of the staff, the Bureau has been able this year by careful management to reduce same from 1d. to ½d. per ton of cane.

THE BROWN CUTWORM (*Euxoa radians* Guen.).

By G. A. CURRIE, B.Sc.

PART II.

TEMPERATURE REACTIONS.

THE cutworm under study is given to sudden and sporadic outbreaks of great severity, and whatever the direct causes of such outbreaks may be, it is the weather which is the ultimate cause of the variation in incidence.

A complete analysis of the factors operating in this connection would be well-nigh impossible, but within certain limits the habits of the cutworm itself reduce that number. As an example of this, it is found that the action of direct wind currents is mostly eliminated by the burrowing habit of the larvæ. Living and feeding amongst an abundance of succulent food counteract the effect of low-atmospheric humidity to a great extent.[2] Resting during the day under cover of food plants and buried in the ground reduces the effect of direct sunlight and allows the larva to burrow towards moisture if it requires to do so. The pupa in its earthen cell is also sheltered from many vicissitudes.

The temperature of its surroundings controls the growth rate of the larva to a great extent, and indeed this can be said of all stages of the life history. If the growth rate in relation to temperature is known, it is possible to predict with considerable accuracy, the time at which different stages will be reached and when recurrence of attacks may be expected.

A knowledge of the temperature relations of *Dysdercus sidæ*[3] gained while assisting in some work on that insect enabled one to go into the field with an accurate knowledge of the stage in which the insects would be found. A study of the temperature relations of all stages of *Euxoa radians* was undertaken with a view to getting a working knowledge of the length of each life stage at different temperatures.

A short résumé of some of the work done on the temperature relations of insects might not be out of place here.

Resume of Some Previous Work.

Abbé (1878) published his work on the thermal constant of locust eggs.

Sanderson (1908) defined the thermal constant as "The accumulation of mean daily temperature, above a critical point for the species, causing it to issue from hibernation or change instars." This is the "temperature summing" which was used by American entomologists in predicting the emergence from hibernation of the boll weevil.

Weissman (1882), working on the seasonal dimorphism of a butterfly, was able to show that if the summer form were cooled down slowly and then warmed up again, it could be made to emerge in October in the winter form. If, however, it were kept at a warm temperature without being cooled down, it would pass the winter before emerging. The cooling down was necessary for the normal development of the winter form. It will thus be seen that the life stage of this insect had a direct effect, apart altogether from its normal reaction to temperature.

Merriam (1894) published the "Laws of Temperature Control of the Geographical Distribution of Temperate Plants and Animals." In that work it is stated that "Animals and plants are restricted in northward distribution by the total quantity of heat, that is to say, the sum total of mean daily temperature above 43 deg. Fahr. during the season of growth and reproduction." The temperature 43 deg. Fahr. was regarded as the temperature below which no perceptible growth occurred. This is the temperature summing principle already mentioned.

Howard (1895) published his work on the temperature relations of household insects, and later showed that the distribution of the yellow fever mosquito (*Aëdes aegypti* L.) was controlled by temperature. A knowledge of its temperature requirements would enable one to predict its behaviour and spread, in districts where it might be accidentally introduced.

Chittenden (1899) showed how low winter temperatures might be effective in preventing the spread of insects to new areas.

Bachmetjew (1901-1902), working on the relation of temperature to insect activity, found that for every insect a definite range of temperatures exists, between the extremes of which the insect is active. At a temperature known as the "optimum," activity is at its greatest. A raising or lowering of the temperature away from the "optimum" lowers the rate or metabolism. At a certain high temperature above the "optimum" activity ceases and metabolism is almost at a standstill, death ensuing in time if the high temperature is maintained. A still higher temperature exists (at which death is instantaneous), and this can be called the "upper thermal death point." A low temperature exists at which activity ceases, metabolism is extremely slow, and a state which can be called "hibernation quiescence" ensues. At a low temperature, the "critical point," the internal heat of the insect suddenly rises, but if cooling is continued the temperature again falls to the "critical point" and death follows.

Sanderson (1905, 1908, 1910) shows how species are restricted to life zones by temperature. He shows the relation existing between temperature and hibernation, and in "The relation of temperature to insect growth" suggests that by keeping a series of insects at constant temperatures a graph can be built up, showing the relation of each insect to the whole range of temperatures to which it may be submitted.

Instead of the "temperature summing" above the developmental zero, he suggests that the percentage of time required to complete each stage at the different temperatures be used as units.

Cotton (1908) used his knowledge of the temperatures required to hatch the eggs of the Southern Cattle Tick to mark out areas which would be safe from infection at different periods of the year.

The "Bioclimatic Law" of Hopkins gives a practical application of the response of insects to temperature.

The combined effect of humidity and temperature has been investigated by various writers, and a great variation in the tolerance to wide ranges of humidity is found in different species. Headlee (1914) investigated the effect of temperature and humidity on the rate of insect development, and Pierce (1916) published a graphical figure showing the effect of a range of temperatures and humidities on the life functions of the boll weevil. Shelford (1926) produced a graphical representation of the effect of combined temperatures and relative humidities in common animals of temperate latitudes.

In this connection it is well to reiterate that Headlee (1914)[2] found that "The rate of metabolism in certain actively feeding insects with abundance of succulent food available is not affected by large differences in atmospheric humidity." These conditions obtain in the Queensland experiments with *Euxoa radians* larvæ, and appear to give a like result, within certain limits.

In some cases it has been found that the temperature reactions of insects vary with the different seasonal generations of the insects under study.

A recent development of temperature work has been published by W. C. Cook.[4] He submitted numbers of cutworms of the species *Porosagrotis orthogonia* and *Chorizagrotis auxiliaris* to varying numbers of hours at high temperatures, alternating with the remainder of the day at a constant low temperature of 8 deg. C. He found that the growth rate per hour at the high temperature when alternating with the low, was greater than the growth rate per hour at a constant high temperature. For the species examined eight hours at the high temperature of 32 deg. C. alternating with sixteen hours at 8 deg. C. gave the greatest growth rate per hour.

From his data in those experiments, Cook (loc. cit.) constructed a solid model with time and temperature as his horizontal axes and growth rate as his vertical axis. The rate of metabolism or growth may be predicted on this model for any time-temperature combination.

Shelford[5] states that development under fluctuating temperatures is 1·02 to 1·08 times as fast as under constant temperatures.

In the constant temperature experiments, to be described later, this matter of fluctuating temperatures in the field must be borne in mind. In practice the half-daily observations used in these experiments over the length of time taken to pass through each instar, would introduce a possible experimental error as great, or in some cases greater than the error due to constant temperature. Field and laboratory controls have been kept, and the results of these are incorporated in the graphs, to show the variation between the time of development at constant, as contrasted with fluctuating temperatures.

Co-ordination of Field and Laboratory Work.

At the Cotton Research Farm, Biloela, a complete set of meteorological records is kept. For entomological use a continually recording thermometer gives the temperatures at a depth of about 1 inch in the ground and under cover of such vegetation as the caterpillars may be using from time to time. This gives a good idea of the temperatures to which the caterpillars or pupæ in the soil are being subjected at any time of the year.

It is found that under cover at a depth of 1 inch to 2 inches in the soil, the daily rise and fall of temperature moves about a mean which is very nearly the true mean of the daily maximum and minimum temperatures.

At such a depth under good cover the daily mean is not far different from the mean daily shade temperature of the air, although not so subject to sudden rises or falls. After the ground has warmed up in summer, however, this soil mean is consistently higher than the shade mean during dry weather. During a dry spring cutworms are frequently found in situations where vegetation is sparse.

Well cultivated fields with cotton seedlings newly through the ground provide such situations. In such cases the heat of the sun during the day raises the surface soil temperatures up to high figures and, where shade is absent, eggs may be destroyed by the heat, while it is also possible that a day of extremely high temperature may destroy pupæ in exposed situations where cover has been removed. On such a day, soil temperature in a place where there was no cover has risen in October, at 2 inches depth to a value of 129·5 deg. Fahr.

In the case of the caterpillars, however, although exposed at times, and for short periods to temperatures of over 100 deg. Fahr., they can always seek cover, and no case has been observed where they have been killed by the direct action of the sun's heat.

These data from the field, coupled with the results of laboratory temperature experiments, help in gaining a good idea of the rate of development, or stage of life history, and activity of the various insects under observation. In the case of *Euxoa radians* field and laboratory experiments were carried out bearing on its rate of growth at different temperatures, and the laboratory technique will now be dealt with.

LABORATORY TECHNIQUE.

In these experiments groups of eggs, larvæ and pupæ were subjected to a range of constant temperatures to determine the duration of each life stage at different temperatures.

A multiple temperature incubator (Model 3) made to the specification of C. B. Williams and T. W. Kirkpatrick,[6] Egypt, was used.

The heat in this case was supplied by an electric bulb with carbon filaments. Each lid covered a compartment in which there was placed a maximum and minimum recording thermometer. Although the temperature in each compartment kept fairly constant, yet the outside temperature and the amount of ice in the ice box, together with possible variations in the electric current, caused some variation which was recorded half-daily on the thermometer. A range of fairly constant temperatures from about 46 deg. Fahr. at the cold end to about 120 deg. Fahr. at the hot end of the incubator was obtained.

A few typical records from different parts of the incubator are given in Table IV. and will serve to show the range of temperatures from which the means were derived.

Pupa.

The pupal instar was first dealt with and for this purpose large numbers of larvæ were collected in the field. They were placed in jars with half an inch of sifted soil into which they could burrow. The jars were open at the top to allow free passage of air. Pigweed (*Portulaca oleraceæ*) was supplied to the larvæ for food, this plant being used throughout the experiments as the standard food for all stages of the larvæ. The larvæ were examined twice daily so that they could be transferred at once to the incubator when they pupated. The size and sex of the pupæ were noted in all cases.

In order to keep soil humidity nearly equal throughout the series of temperatures, the soil in which the pupæ lay was kept moist. Moistening had to be done frequently in the warm compartments and seldom in the cold ones. Each pupa was placed in a 2-ounce glass jar on sifted soil, the jar having a number etched into it, the lid not being used so that air circulated freely.

When emergence of the adult moth was seen to be imminent, by the darkening of the pupa, a plug of cotton wool was placed in the mouth of the jar to prevent escape of the moth. A piece of stiff cardboard was leant across the jar from top to bottom so that the emerging moth could cling to its under surface to unfold its wings.

Egg.

These were placed in glass jars in groups of twenty. In the hot compartments some moistening was done to prevent desiccation. Hatching was watched for, and the larvæ supplied with food and covered over to prevent escape.

Larval Instars.

While small, the larvæ were put into jars in batches of ten, and fed on pigweed. A very little soil was given at first, the quantity increasing with size. New food was given daily and the soil frequently changed to keep conditions hygienic. Uniformity of humidity was not possible in the different compartments, but the soil in each was kept slightly moist to maintain uniformity as far as possible.

Owing to the high mortality of cutworm larvæ large numbers were necessary in each series. Much difficulty was experienced in finding the head capsules from the moults, so individual larvæ were isolated for the purpose. The larvæ seemed to do better in groups until they were nearly full grown, when they did well separately. In order to get a reliable indication of the average time taken to complete a stage, three methods were used:—(1) Single larvæ were isolated and their moults observed and noted; (2) Groups of larvæ were kept together and the first individual to moult to the following instar noted, and the last, for each succeeding stage; (3) Groups of larvæ individually noted were averaged as to their moulting times.

A certain amount of compensation was noticed in healthy broods, for, when certain individuals took abnormally long to go through one or two instars, they tended to shorten the later ones. In this way the variation in pupation dates was relatively less than the variation in the dates of passing from the earlier to later larval instars.

The larvæ were found to thrive best when sifted soil and plant debris were present for them to shelter in and this added to the difficulty of observation.

In the groups of larvæ the moults were observed by the light colour of the head capsule and skin of the newly moulted larvæ, the individuals not newly moulted being much darker in colour.

In the incubator the larvæ were kept in darkness so that there was a possibility that this might affect the rate of development. To check this a group of newly hatched larvæ was divided in two. One lot of larvæ was kept in the laboratory in a jar freely exposed to the light, while the other lot was placed in a similar jar but wrapped round with brown paper to exclude light completely. A slightly faster rate of growth was observed on the part of the cutworms reared in the dark, but the difference noted was not great. Table III.

Experiments were also carried out with series of larvæ as near field conditions as possible, so that their rate of development could be compared with that of the larvæ in the incubator, subjected to a constant temperature.

Adult.

On emergence from pupation the moths were placed in pairs (male and female) in large glass jars with cheese-cloth covers.

In the field eggs were laid in the loose soil under low-spreading vegetation. In jars without soil, moths laid under compulsion, but laid more freely when loose soil was sprinkled over the bottom, and plants of pigweed laid on top of it. The eggs were found laid on the glass bottom of the jar, so firmly cemented on that they could not be removed without bursting.

It was necessary to get the eggs on some movable medium to be used in the incubator, so the following expedient was adopted. A false bottom of brown paper was placed in the jar and soil sprinkled over it. The eggs were found each morning firmly cemented to the brown paper, which could be lifted out, the eggs counted, and the paper cut up into pieces having any desired number of eggs adhering.

The moths were fed on sugar solution, honey solution, or fresh flowers were given them to feed from. Each pair was removed to a freshly prepared jar daily, and the old one searched for eggs. Besides being laid through the loose soil on the brown paper, eggs were often found on the pigweed leaves. In one case where water had been spilt over the bottom of the par, soaking the soil, the female laid her eggs on the cheese-cloth cover of the jar.

RESULTS OF TEMPERATURE WORK.

In setting out the results of the temperature work the graphical method of representing the data has been used wherever possible. Where graphs are not suitable the results are tabulated.

In the following table is found the results of the experiment to compare the rate of development in cutworms exposed to normal daylight, with those kept in darkness, all other conditions being as nearly as possible equal.

Fifty first instar larvæ were used in Series 1, thirty in Series 2, but only those which reached pupation are recorded in the Table.

TABLE III.—Egg Hatching to Pupation in Light and in Darkness.

Series 1.

—	Darkness.	Light.	Average Temperature.
1	47 days	40 days	23·8 deg. C.
2	37 days	41 days	23·8 deg. C.
3	40 days	46 days	23·8 deg. C.
4	41 days	39 days	23·8 deg. C.
Averages ..	41·25 days	41·5 days	..

Series 2.

—	Darkness.	Light.	Average Temperature.
1	32 days	34 days	25·5 deg. C.
2	33 days	33 days	25·5 deg. C.
Averages ..	32·5 days	33·5 days	..

The numbers surviving are too small to do more than indicate a probability, but the larger numbers of ordinary laboratory and field observations can be compared with the incubator numbers for further confirmation.

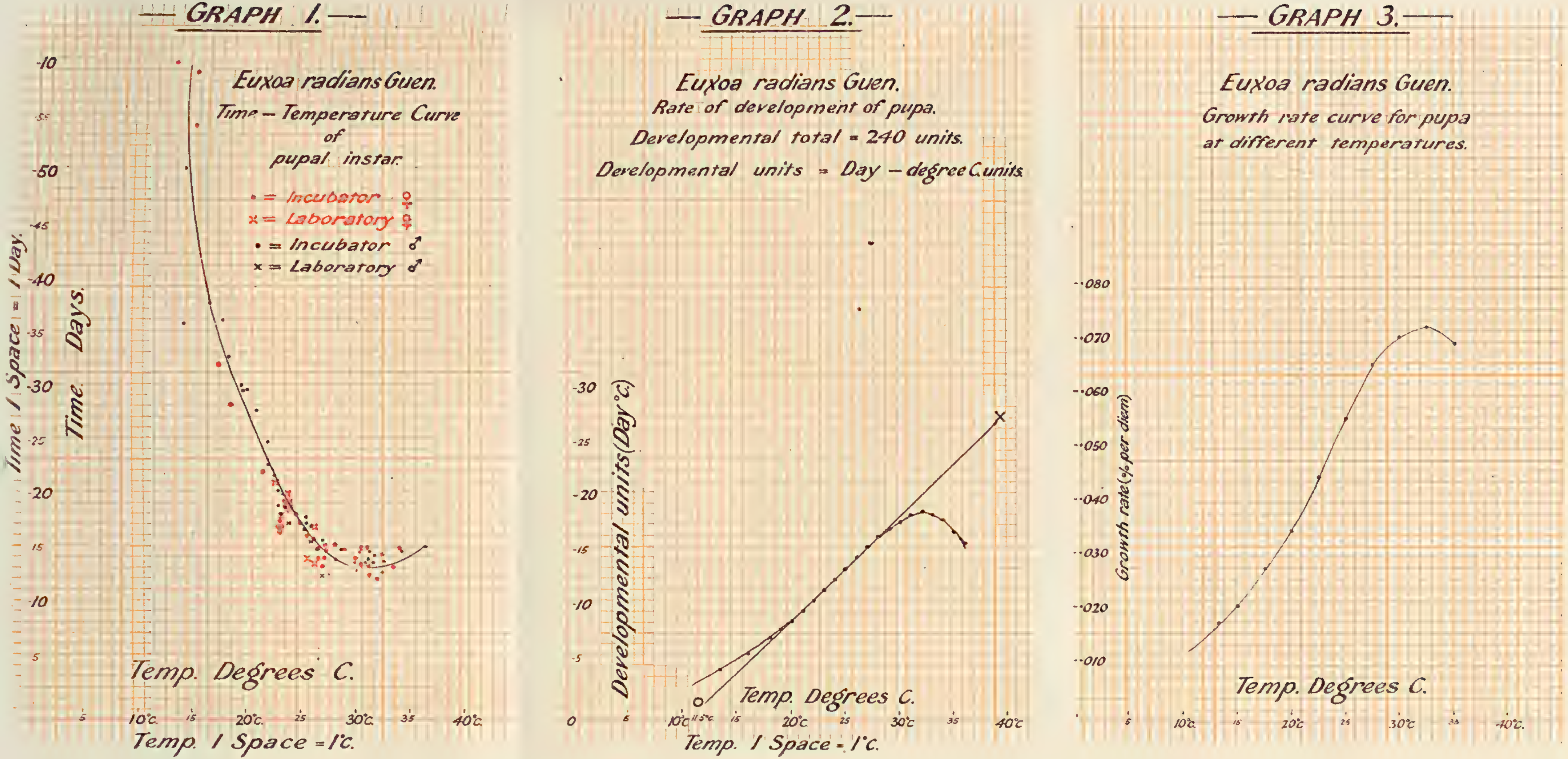
The results of the work with the pupæ will be reviewed first, as this instar was more intensively observed than the others, owing to its interest in the field as the stage which survives severe winter weather.

A few typical temperature records taken from the hot end, the middle, and the cool end of the incubator will show the daily range of temperatures obtaining within the compartments of the incubator used. The fact that there is a fluctuation in temperature makes it impossible to call the work strictly constant temperature work, but the range is too small to cause any marked change of growth rate due to such fluctuation.

TABLE IV.

TYPICAL TEMPERATURE RECORDS ON LIFE SHEETS OF PUPÆ IN INCUBATOR.

COMPARTMENT (3).			COMPARTMENT (12).			COMPARTMENT (19).		
Length 19·5 mm. ♀ pupa. Pupated 12 noon, 29 Dec., 1927			Length 20 mm. ♀ pupa. Pupated 7-8 Dec., 1927.			Length 19 mm. ♂ pupa. Pupated 4-5 Dec., 1927.		
Date.	Max. °F.	Min. ° F.	Date.	Max. °F.	Min. ° F.	Date.	Max. °F.	Min. ° F.
1927.			1927.			1927.		
29 Dec. ..	94	90	8 Dec. ..	78	76	5 Dec. ..	76	68
30 Dec. ..	97	91	9 Dec. ..	77	74	6 Dec. ..	73	68
31 Dec. ..	98	91	10 Dec. ..	78	74	7 Dec. ..	71	65
1928.			11 Dec. ..	79	76	8 Dec. ..	68	65
1 Jan. ..	99	94	12 Dec. ..	77	75	9 Dec. ..	68	65
2 Jan. ..	98	90	13 Dec. ..	77	74	10 Dec. ..	68	64
3 Jan. ..	92	88	14 Dec. ..	77	74	11 Dec. ..	70	66
4 Jan. ..	94	90	15 Dec. ..	78	75	12 Dec. ..	68	65
5 Jan. ..	93	90	16 Dec. ..	80	78	13 Dec. ..	67	65
6 Jan. ..	99	90	17 Dec. ..	78	75	14 Dec. ..	69	65
7 Jan. ..	98	92	18 Dec. ..	77	75	15 Dec. ..	70	66
8 Jan. ..	97	90	19 Dec. ..	78	76	16 Dec. ..	69	64
9 Jan. ..	91	89	20 Dec. ..	79	75	17 Dec. ..	68	65
10 Jan. ..	90	87	21 Dec. ..	77	73	18 Dec. ..	68	66
11 Jan. ..	92	89	22 Dec. ..	77	75	19 Dec. ..	69	66
12 Jan. ..	91	89	23 Dec. ..	78	77	20 Dec. ..	70	66
			24 Dec. ..	75	72	21 Dec. ..	68	65
			25 Dec. ..	72	70	22 Dec. ..	68	64
			26 Dec. ..	78	72	23 Dec. ..	69	65
						24 Dec. ..	65	61
						25 Dec. ..	63	60
						26 Dec. ..	70	63
						27 Dec. ..	71	67
						28 Dec. ..	71	67
						29 Dec. ..	70	66
						30 Dec. ..	71	65
						31 Dec. ..	70	67
						1928.		
						1 Jan. ..	71	69
						2 Jan. ..	71	68
Emerged adult 12-13 Jan., 1928. Average, Temp. 92·5 deg. Fahr. Time, 14½ days.			Emerged adult, 26-27 Dec., 1927. Average Temp. 76 deg. Fahr. Time, 18-19 days.			Emerged adult 3 Jan., 1928. Average Temp. 67·3 deg. Fahr. Time, 29 days.		



Graphs showing rate of development of eggs and larvæ of *Euxoa radians* Guen. in relation to temperature.

Graph 1 shows the time-temperature curve for the pupal instar. The points marked represent individual pupæ. The curve sketched in is arbitrary, arrived at by averaging times in temperature class groups, and is only included to indicate the general direction of the theoretical curve.*

Graph 2 shows the same set of data used to give the growth rate, or better "development rate," in developmental units. The method is as follows[5]:— The developmental zero, or temperature below which no visible development occurs can be determined for the species from the time-temperature graphs.

For example, this can readily be done by taking two points on the time-temperature curve between 20 deg. C. and 28 deg. C. Time and temperature are multiplied together at the two points, the results subtracted, and the remainder divided by the difference in the number of days between the two points, e.g.:—

Temperature 20 deg. C. × days 28·5 =	570
Temperature 21 deg. C. × days 25·5 =	535
Difference	35

Difference between points in days, 3.
Developmental zero = 11·66 deg. C.

By averaging a number of such results the approximate developmental zero for *Euxoa radians* was found to be 11·5 deg. C. This developmental zero is a theoretical and not a true biological point, as can be seen from the graph.

The developmental zero being established, the temperature summing curve can be proceeded with. The developmental total in day-deg. C. units is got by multiplying the number of days taken to complete a stage at any temperature, by that temperature in deg. C. less 11·5 deg., e.g.,—

At 27 deg. C. No. of days = 15·5.

Developmental total = 15·5 × (27 deg. − 11·5)
= 15·5 × 15·5
= 240 day deg. C. units.

The average developmental total in the range 20 deg. C. to 28 deg. C. was found to be near 240 day deg. C. units. By dividing this figure by the number of days taken to complete each stage at any given temperature, a number is obtained which represents the number of developmental units gone through each day at that temperature, e.g.:—

At 20 deg. C. 8·5 units of the total 240 are gone through in one day.

From a series of such points the Graph B. has been built up, and from it can be read off, at any temperature, the daily growth of the pupa in developmental units.

It will be seen that in B. the curve between 20 deg. C. and 28 deg. C. is a straight line, which means that between those limits growth rate and temperature increases proportionately. This straight part of the curve produced to OX is at an angle of 45 deg. to the horizontal so that the reading along both axes is the same for the straight part of the curve, if the point O. or developmental zero, is read as true zero on the horizontal axis.

Above 28 deg. C. and below 20 deg. C. this relation does not hold true. In the former case increase of temperature above 28 deg. C. leads

* In order to arrive at the true position and shape of the curve for the points obtained experimentally, the *curve fitting* may be done by the "Method of Least Squares" as explained by R. Pearl in his "Introduction to Medical Biometry and Statistics," 1927, Chapter XVI., pp. 332-341.

at first to a decrease in the acceleration of the growth rate, and above 32 deg. C. to a retardation in relative growth rate.

Below 20 deg. C. falling temperature tends to cause development to decrease at a lower rate, so that the curve tends to become asymptotic to the temperature axis.

There must be a point in the low temperature range at which development and activity cease, either from the freezing of the "free water"* in the organism or from the cessation of feeding, assimilation, or some other life function.

This point was not determined experimentally in the present experiments, but from the general shape of the curve it would appear to be between 3 deg. C. and 5 deg. C. This being so, the curve cannot become a true asymptote to the temperature axis.

In Graph 3 the data from A. are represented in a growth rate curve. The growth rate is the percentage of total development passed through in any period of time (in this case a day) at any given temperature. It is the reciprocal of the time taken to pass through any one stage of life history of the species; in this case the pupal, e.g.:—

At a temperature of 15 deg. C. it takes 50 days to complete the pupal instar. The reciprocal of time is one-fiftieth and this is represented on the vertical axis as ·02.

The slow growth rate at low temperatures allows the pupa to remain in the ground in the cold winter for a long period, and so pass over in a quiescent state the period when food is not available.

The egg curve in Graph 4 is made up from observations of the hatching time of batches of twenty eggs at different temperatures. Each point on the curve therefore represents twenty individuals. The regularity of distribution of these points is obviously due to the absence of many vicissitudes which assail the other life stages.

The time temperature curves for the six larval instars are shown in Graphs 5, 6, 7, 8, 9, 10, respectively. Each point on 5 represents ten larvæ, on 6 five larvæ, on 7 two larvæ, on 8 two larvæ, and in 9 and 10 one larva.

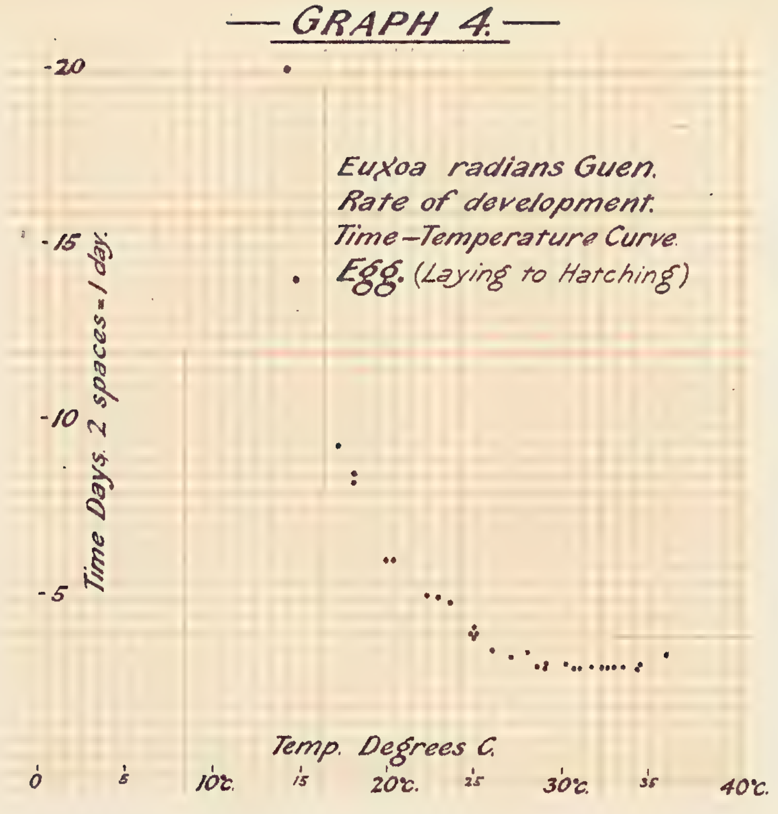
The curve Graph 11 represents the total larval developmental period —egg hatching to pupation. It was arrived at by summing the data of all the larval instar curves and adding the prepupal stasis. The relative value of this curve can be seen by comparing it with the true points got in the incubator, laboratory, and field for the total larval periods; these points being shown separately on the graph.

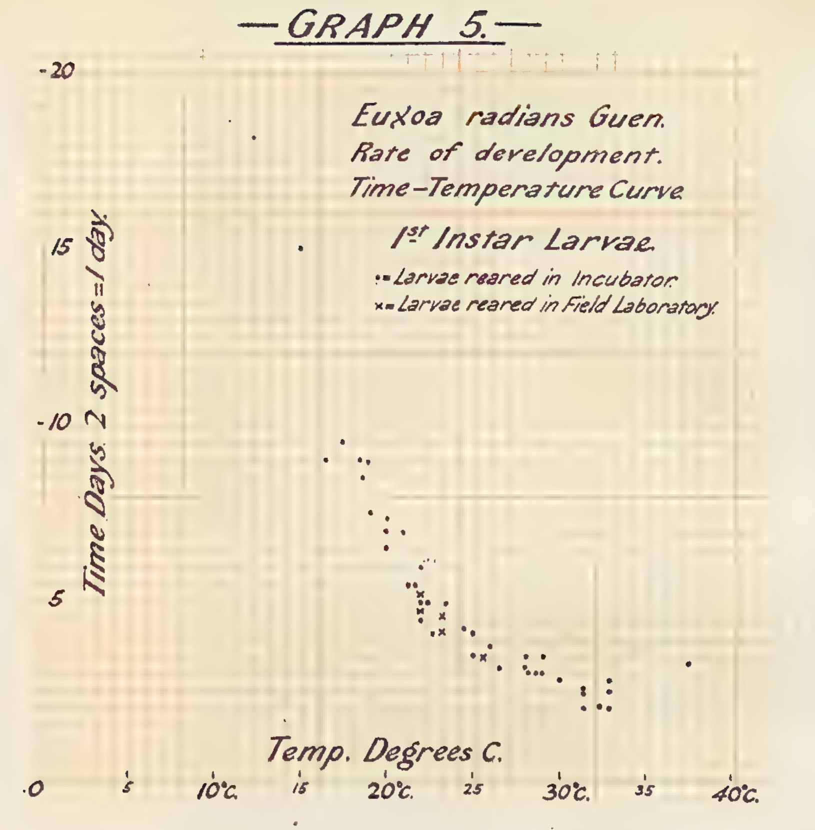
Time and temperature, or rather growth rate and temperature, can be treated as two variants and their frequency distribution plotted.

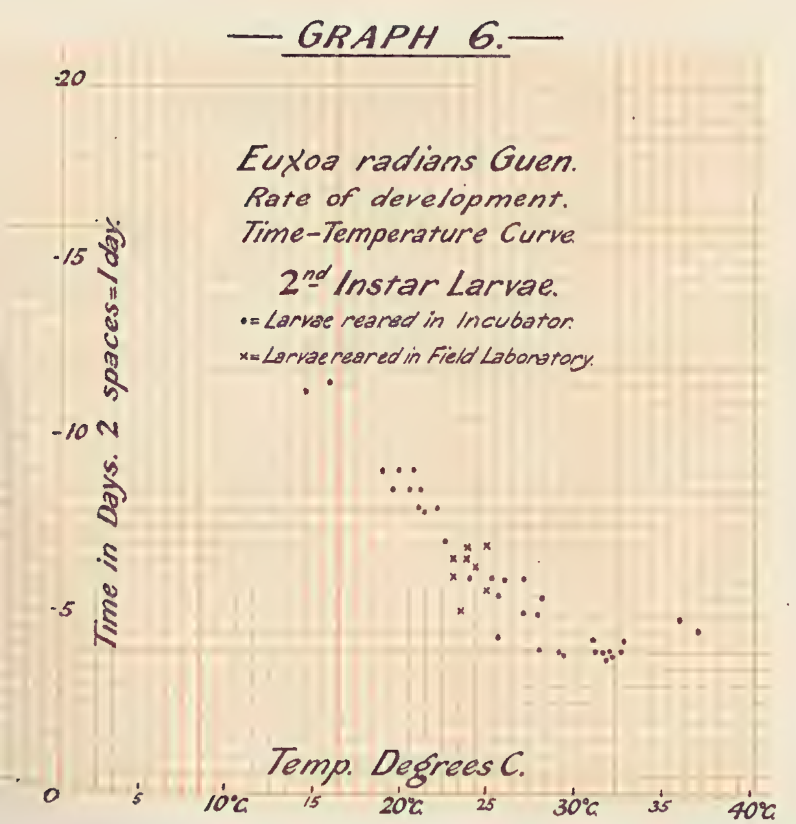
The product-moment method of determining the correlation between two variants is not adapted to curvilinear progression, so that the ordinary time-temperature points cannot be used in this connection. That part of the growth rate curve between 20 deg. C. and 28 deg. C. which has already been seen to be straight can be employed however, the reciprocals of time being used, instead of time in days.

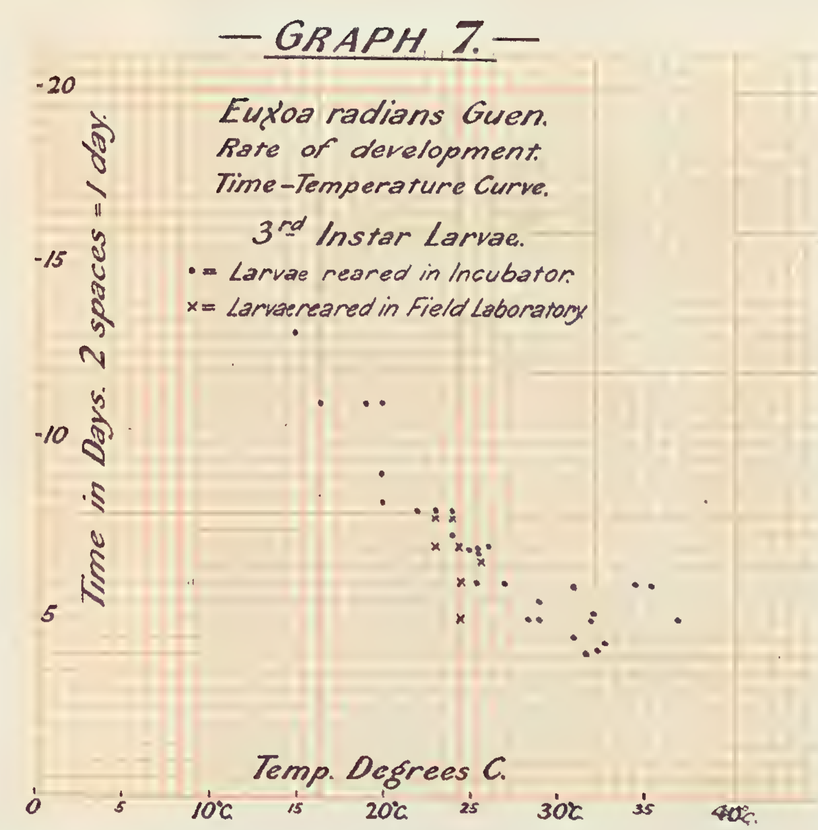
Examination of the data in the light of this mathematical method gives a true measure of the accuracy of the figures relative to complete correlation.

* This "free water" as contrasted with "bound water" is dealt with by W. Robinson in the "Journal of Economic Entomology," vol. 20, No. 1, p. 80. "Water Binding Capacity of Colloids a Definite Factor in Winter Hardiness of Insects."

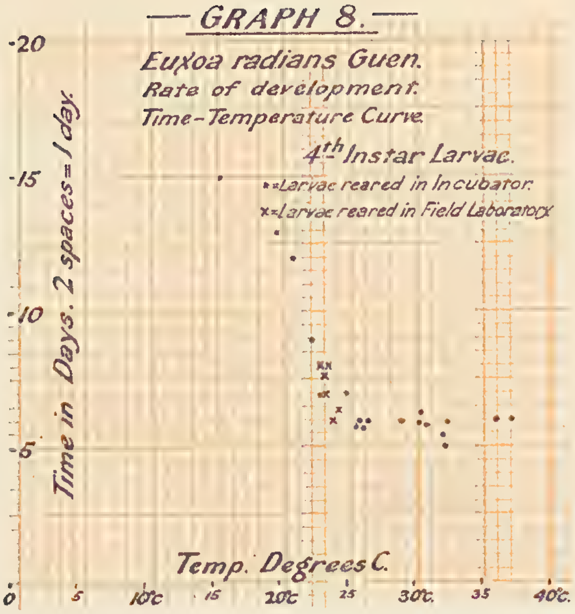


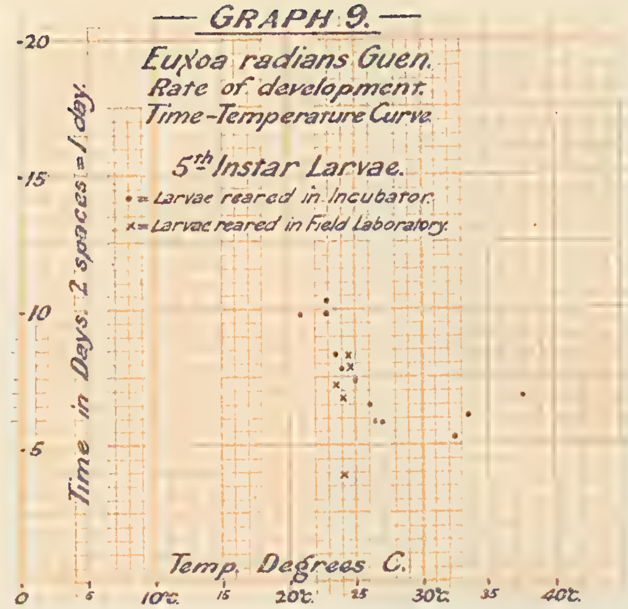


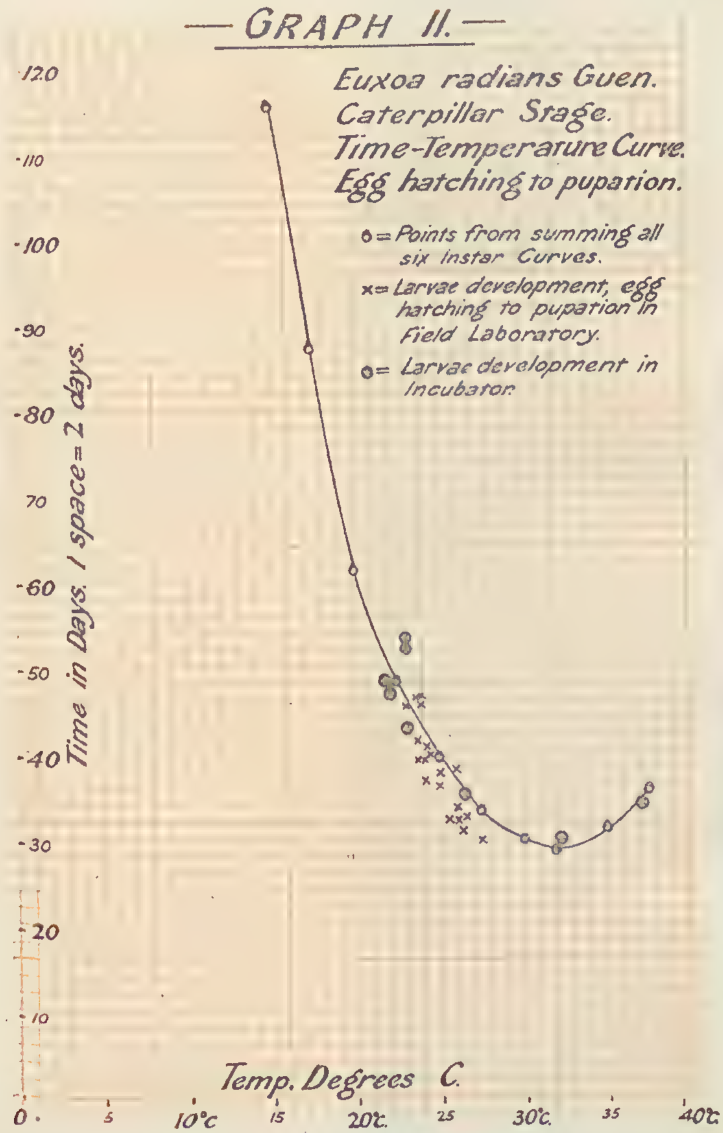




Graphs showing rate of development of eggs and larvæ of *Euxoa radians* Guen. in relation to temperature.







Graphs showing rate of development of larvæ of *Euxoa radians* Guen. in relation to temperature.

The example given below shows the method used by the plant-breeders Hayes and Garber[7] applied to the data found for the egg of *Euxoa radians*.

Euxo radians Guen. EGG DEVELOPMENTS—LAYING TO HATCHING.

CORRELATION OF DEVELOPMENT RATE AND TEMPERATURE BETWEEN THE TEMPERATURES 19·5° C. AND 28·5° C.

TEMPERATURE CLASSES EACH $1\frac{1}{2}$° C.

DEVELOPMENT RATE CLASSES. Class = ·03 of time taken to complete stage.

	1	2	3	4	5	6	fy	$\Sigma(yX)$	$\Sigma(yX^2)$	$\Sigma(XY)$	$y\bar{X} = \Sigma\frac{yX}{fy}$
(·15 – ·18) 1	2						2	2	2	2	1
(·18 – ·21) 2		1	1				2	5	13	10	2 5
(·21 – ·24) 3			1	1			2	7	25	21	3·5
(·24 – ·27) 4				3			3	12	48	48	4
(·27 – ·30) 5					2		2	10	50	50	5
(·30 – ·33) 6						2	2	12	72	72	6
fx	2	1	2	4	2	2	13	48	210	203	22
$\Sigma(xY)$	2	2	5	15	10	12	46				
$\Sigma(xY^2)$	2	4	13	57	50	72	198				
$\Sigma(XY)$	2	4	15	60	50	72	203				

$$\frac{\Sigma(xY)}{n} = \frac{46}{13} = 3\cdot54 = \bar{Y}$$

$$\frac{\Sigma(xY^2)}{n} = \frac{198}{13} = 15\cdot23$$

$$\frac{\Sigma XY}{n} = \frac{203}{13} = 15\cdot6$$

$$\frac{\Sigma(yX)}{n} = \frac{48}{13} = 3\cdot7 = \bar{X},$$

$$\frac{\Sigma(yX^2)}{n} = \frac{210}{13} = 16\cdot15,$$

$$\frac{\Sigma(XY)}{n} = \frac{203}{13} = 15\cdot6.$$

$$rxy = \frac{\frac{\Sigma(XY)}{n} - \bar{X}\,\bar{Y}}{\sqrt{\frac{\Sigma(yX^2)}{n} - \bar{X}^2}\;\sqrt{\frac{\Sigma(xY^2)}{n} - \bar{Y}^2}}$$

$$rxy = \frac{15\cdot6 - 13\cdot1}{\sqrt{16\cdot5 - 13\cdot69}\;\sqrt{15\cdot23 - 12\cdot53}}$$

$$rxy = \frac{2\cdot5}{1\cdot64 \times 1\cdot67} = \frac{2\cdot5}{2\cdot7}$$

$$rxy = \cdot926 \pm \cdot025$$

$$\text{P.E.} = \frac{\cdot6745\,(1 - r^2)}{\sqrt{n}} = \frac{\cdot091}{3\cdot6} = \cdot025.$$

In the ideal case where no other factor enters in to affect growth rate, the correlation between growth rate and temperature would be 1 (i.e., 100 per cent.).

In practice it is found that the best correlation is shown where the same number of observations is taken in each temperature class.

In the example it will be seen that the temperature classes are one and a-half degree classes, while the growth rate classes are each ·03 of the total time taken to pass through that life stage.

One of the factors (and one already mentioned) which tends to reduce the correlation ratio between growth rate and temperature is the factor of compensation. An example of that is seen in Graph 9 where a larva took only four days instead of the normal seven to nine days at 24 deg. C. to complete the fifth instar.

The high degree of correlation and the compact form of the graph for the egg and first instar larvæ are not maintained in the later instars. The degree of correlation which nearly approaches "one" in the egg stage slowly falls down as the age of the larvæ increases, the bigger larvæ being open to relatively more disturbance by external, and probably internal influences.

Humidity as a factor appeared to act as follows:—At all "medial" humidities, that is to say, between 30 per cent. and 80 per cent. relative humidity, the correlation between time and temperature seemed unaffected by humidity. When, however, the relative humidity went over 80 per cent. for any period longer than half a day continuously, there was a retardation in the growth rate and an unhealthy condition of the larvæ. If the high humidity continued and the temperature was high, death generally supervened.

This aspect of the subject will be more fully dealt with in the oecological discussion to follow, and examples of humidities causing disease and death are tabulated. (Table VII.)

The following table gives the average time taken by the various stages of *Euxoa radians* to complete those stages at "medial" humidities and in the case of the larval instars, in the presence of unlimited food:—

TABLE V.

AVERAGE TIME IN DAYS TO COMPLETE EACH INSTAR.

Average Temperature.	Egg.	1st instar.	2nd instar.	3rd instar.	4th instar.	5th instar.	6th instar.	Egg hatching to pupation.	Pupal instar.	Egg laying to adult moth.
17 deg. C. ..	9	9½	11	11½	13	14	34	94	36	139
20 deg. C. ..	6¼	7	8½	9	10	10½	17	62	28	96
23 deg. C. ..	4¾	5	6¾	7¼	8	8½	12½	48	20	73
26 deg. C. ..	3½	3¼	5	6	6¼	7	11	38	16	58
29 deg. C. ..	3	2¼	4¼	4¾	5¼	6	10	32½	14½	50
32 deg. C. ..	3	2	3¾	4¼	5	5½	9½	30	13	46

It will be seen that the figures for the sixth instar larvæ include the prepupal stasis and the figures for egg laying to adult moth have been brought to the nearest whole number. The temperature 32 deg. C. is the optimum in the sense of most rapid development for the species, but the use of the word "optimum" in that connection must not be confused with the "optimum" conditions for the survival or increase of the species.

The activities of the imagines were found to be affected by temperature in the same way as the development of the larval stages.

The periods before mating and after mating and before oviposition were found to be increased by low and decreased by high temperatures.

Some of the periods found in the laboratory for female moths are shown in the table:—

TABLE VI.

Period between Emergence of Females and Oviposition.

No.	Date Emerged Adult.	Average Temperature.	Date of First Laying.	Days—Emergence to First Lay.
	1927.		1927.	
1 ..	6 Dec. ..	22·5 deg. C.	14 Dec. ..	8
2 ..	9 Dec. ..	22·5 deg. C.	16-17 Dec. ..	7-8
3 ..	21 Dec. ..	24·0 deg. C.	28 Dec. ..	7
			1928.	
4 ..	25-26 Dec. ..	24·5 deg. C.	31 Jan. ..	6
5 ..	26 Dec. ..	24·5 deg. C.	2 Jan. ..	6
6 ..	28 Dec. ..	24·5 deg. C.	3 Jan. ..	6
	1928.			
7 ..	30 Jan. ..	26·0 deg. C.	2-3 Feb. ..	3-4
8 ..	3 Feb. ..	26·0 deg. C.	7 Feb. ..	4
9 ..	5 Feb. ..	26·0 deg. C.	8 Feb. ..	3
10 ..	10 Feb. ..	26·6 deg. C.	13 Feb. ..	3
11 ..	29 Jan. ..	26·6 deg. C.	31 Jan., 1 Feb...	2-3

The response by all stages of the life history of *Euxoa radians* to temperature has now been established. Little development takes place at 15 deg. C. and the most rapid rate is found at 32 deg. C., above which temperature there is a decrease in the rate of development. At a continuous temperature of 37 deg. C. all stages of the species succumb after a longer or shorter interval, but death from instantaneous exposure requires a much higher temperature.

DESCRIPTION OF LIFE CYCLE STAGES.

Adult.

(Description extracted from "Catalogue of the *Lepidoptera phalaenæ*," Vol. IV., Brit. Mus. N.H., 1903.)

Plate I., figs. 3 and 4.

Euxoa radians.

"*Agrotis radians* Guen., Noct. i. p. 261 (1852).
Agrotis munda Wlk., x. 348 (1856).
Mamestra basinotata Wlk., xv. 1686 (1858).
Agrotis turbulenta Wlk., xxxii., 703 (1865).
Agrotis injuncta Wlk., xxxii., 703 (1865).
Agrotis scapularis Feld. Reis. Nov., pl. 110. f. 13 (1874).

"Head and thorax reddish brown mixed with white; tegulæ with dark medial line; abdomen pale ochreous suffused with fuscous, the ventral surface whitish irrorated with brown, the anal tuft rufous; tarsi banded with black. Fore wing brown mixed with white especially towards costa, on which is a series of small black spots; the veins with dark streaks, the median nervure and vein 1 defined on each side by white; a curved sub-basal line from costa to sub-median fold, interrupted in cell; a curved double antemedial line between median nervure and vein 1 filled in by whitish; claviform elongate, dark brown defined by black; orbicular and reniform with fuscous centres, whitish annuli and black outline, the former small, elliptical, the latter well developed and with the cell between the stigmata dark brown; the post-medial line very indistinct, minutely waved, bent outwards below costa, excurved to vein 4, then oblique; the terminal area much browner; the subterminal line prominent and white or very indistinct, dentate, with a series of dentate blackish marks before it and streaks in the interspaces beyond it ending in the terminal series of small black lunules; cilia pale, with two fine brown lines through them. Hind wing semihyaline white, the costal and inner areas tinged with ochreous; the veins brownish, the termen suffused with fuscous, narrowing from costa to a point at vein 2; cilia white, fuscous at apex. Underside of fore wing white, with

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Plate I.

Euxoa radians Guen.

Fig. 1—Eggs attached to leaf .. .. x 20
Fig. 2—Pupa (male) .. .. .. x 2
Fig. 3—Adult male .. .. Natural size
Fig. 4—Adult female .. .. .. Natural size
Fig. 5—Damage to cotton seedling by 1st instar larvæ.
Fig. 6—Damage to cotton seedling by 3rd instar larvæ.

PLATE I.—THE BROWN CUTWORM (*Euxoa radians* Guen.)

From Watercolour Drawings by I. W. HELMSING.

small discoidal lunule and the terminal area suffused with fuscous; hind wing with rounded apical black patch. ♀ Usually suffused with fuscous, the markings obscure.''

The only note to be added to the above description is that the cold weather forms are much more prone to having fuscous markings suffused than the hot weather forms, which are much lighter in general ground colour.

One female recovered in the cold end of the incubator was practically black all over.

Egg.

This is a typical noctuid egg, spheroidal and slightly flattened on one side. (Plate I., fig. 1.) The flattened part may be considered to be attached ventrally to facilitate description. Ridges radiate from the slight protuberance at the tip towards the flattened part. Thickened ridges encircle the egg longitudinally, cutting the radiating ridges at right angles. When newly laid the colour is milk white, but this changes to a light cream as the embryonic development proceeds. A reddish-brown spot then appears at the top, and a band of the same colour forms an equatorial belt round the egg. When about to hatch the dark head capsule and pro-thoracic shield of the larva can be seen through the shell, and the large clubbed setæ on the body can be plainly seen.

The head lies under the apex of the egg, where the micropyle is situated, while the body lies coiled underneath around the periphery.

Average weight	.. ..	·0022 grams.
Average diameter	.. ..	·6 mms.

Larval Instars.

In the descriptions which follow the nomenclature adopted by Ripley[8] has been used in the case of the chætotaxy, while he in his turn used the system of Fracker[9] with some additions.

Ripley (*loc. cit.*) considered that the chætotaxy and other features of the head capsule, and the characters of the spinneret, had taxonomic value in the noctuid larva examined by him. In the present bulletin these characters have been featured and the chætotaxy of the body segments marked out. This was done as the author has not yet seen any illustration from the genus ''Euxoa'' and because certain of the minute setæ which were in doubt have been clearly distinguished in the first instar larvæ and have been figured (Plate III.).

The epicranial index, i.e., the ratio between the length of the frons and the length of the epicranial stem $\frac{F}{ES}$ are given for each instar.

First Instar Larva (Plate II., fig. 1).

Head capsule width ·325 mm.

Epicranial index $\frac{F}{ES}$ $\frac{\cdot 13}{\cdot 05} = 2{\cdot}6$.

Length 3 to 4 mm.

Crotchet formula for larvapods $\frac{0}{0}$ $\frac{4}{4}$ $\frac{5}{5}$ $\frac{5}{5}$ $\frac{8}{8}$.

Head capsule colour, dark brown. The chætotaxy of the head capsule is shown in Plate VI., fig. 1. This figure is given to contrast with the figure of the head capsule of the sixth instar larva (Plate VI., fig. 2).

Some outstanding differences between first and sixth instar head capsules apart from mere size are:—

First Instar.	Sixth Instar.
Relatively large setæ, particularly v2.	Setæ relatively small.
Adfrontal suture absent.	Adfrontal suture present.
Ocelli relatively large.	Ocelli relatively smaller.
Epicranial index—2·4.	Epicranial index—4·25.

The chætotaxy of the head of the first instar larva corresponds to the figures in Ripley's work apart from relative position. The only addition in this figure is a small sensorium near ocelli 1 and 2.*

This sensorium has been found in all noctuid larvæ examined and is difficult of observation because of its small size and position. We have named it S.V.4.

All the setæ except the minute ones on the head and body are clubbed, the clubbed ends being hollow. On the sur-anal plate are found the largest setæ, having a length of ·225 mm. and a width at the clubbed end of ·009 mm. The length of setæ $\propto$ and β = ·16 mm.

There is no visible pigment in the skin of this larva but small protuberances at the base of the setæ are slightly chitinised, the chitin having a faint brown tinge.

The spinneret figured in Plate VII., fig. 3, is of a reduced type.

A general idea of the appearance of the larva is given in Plate V., fig. 5.

The thoracic legs are relatively large and on the first thoracic segment is the dark-brown pro-thoracic shield which is strongly chitinised.

Abdominal segments 1, 2, and 3 carry no larvapods. Those on segments 4 and 5 are very much reduced, while well developed ones are found on segments 6 and 7 and on the anal segment. The crotchet formula, or number of hooks present on each larvapod reading from front to rear is given at the beginning of this description. They are arranged in a uniordinal meso-series. The numbers vary and those quoted only give an example.

* This sensorium was first noticed by the artist, I. W. Helmsing, while drawing the head capsule of *Remigia frugalis*.

Plate II.

Euxoa radians Guen.

Fig. 1—First Instar Larva	.. ..	× 8
Fig. 2—Second Instar Larva	.. ..	× 8
Fig. 3—Third Instar Larva	.. ..	× 4
Fig. 4—Fourth Instar Larva	.. ..	× 4
Fig. 5—Fifth Instar Larva	.. ...	× 2½
Fig. 6—Sixth Instar Larva	.. ..	× 1½

PLATE II.—THE BROWN CUTWORM (*Euxoa radians* Guen.)

From Watercolour Drawings by I. W. HELMSING.

Plate III. shows the arrangement of the setæ on all the segments of *Euxoa radians* first instar. On this larva are found all the setæ illustrated by Fracker in his figure of *Felta gladitoria,* and in addition the minute setæ xa, xb, xc, and xd figured by Ripley in his figure of the mature larva of *Cirphis unipuncta.*

In the case of *Felta gladitoria,* Fracker states: "On the prothorax, eta of the kappa group, all the tau group and sigma are wanting."

In the case of *Euxoa radians* first instar, all of these setæ are present, but are extremely minute.

Eta of the kappa group is shown in close association with kappa. Both tau and omega are present in the tau group. Sigma is present though minute, and is situated on the caudal edge of the coxa of each thoracic leg.

The minute setæ marked xa, xb, xc, and xd are present on the thorax as follows:—

xa is on the caudal margin of the prothoracic shield and xb near the cephalic margin of the mesothorax slightly dorsad of alpha. Both xa and xb are present close together on the metathorax in line with, and cephalad of alpha.

xc and xd are present as one group on the mesothorax, and on the metathorax in line with, and cephalad of epsilon, but further from the cephalic margin than xa and xb.

The prothoracic shield, strongly chitinised and dark brown, has three sensoria (s); two just caudad and dorsad of alpha and the third near gamma.

On the abdominal segments 1 to 8 inclusive are to be noted the three minute setæ x, epsilon, and omega, none of which appear in the illustration of *Felta gladitoria.*

On segment 9, epsilon is not present although x and omega are retained.

The homotypy of segment 10 is not clear, so is not fully annotated in the figure, the only named setæ being alpha, beta, kappa, and rho, on the sur-anal plate.

SECOND INSTAR LARVA (Plate II., fig. 2).

Head capsule width	·52 mm.
Epicranial index $\frac{F}{ES}$	$\frac{\cdot 225}{\cdot 09} = 2{\cdot}5$
Length of body	4 to 6 mm.
Crotchet formula of larvapods $\frac{0}{0}\ \frac{4}{4}\ \frac{6}{6}\ \frac{6}{6}\ \frac{8}{8}$	

Head capsule colour, light brown when newly moulted, darker later. Prothoracic shield light brown and not conspicuous. The setæ are relatively smaller than in first instar, and some additional "secondary" setæ are present.

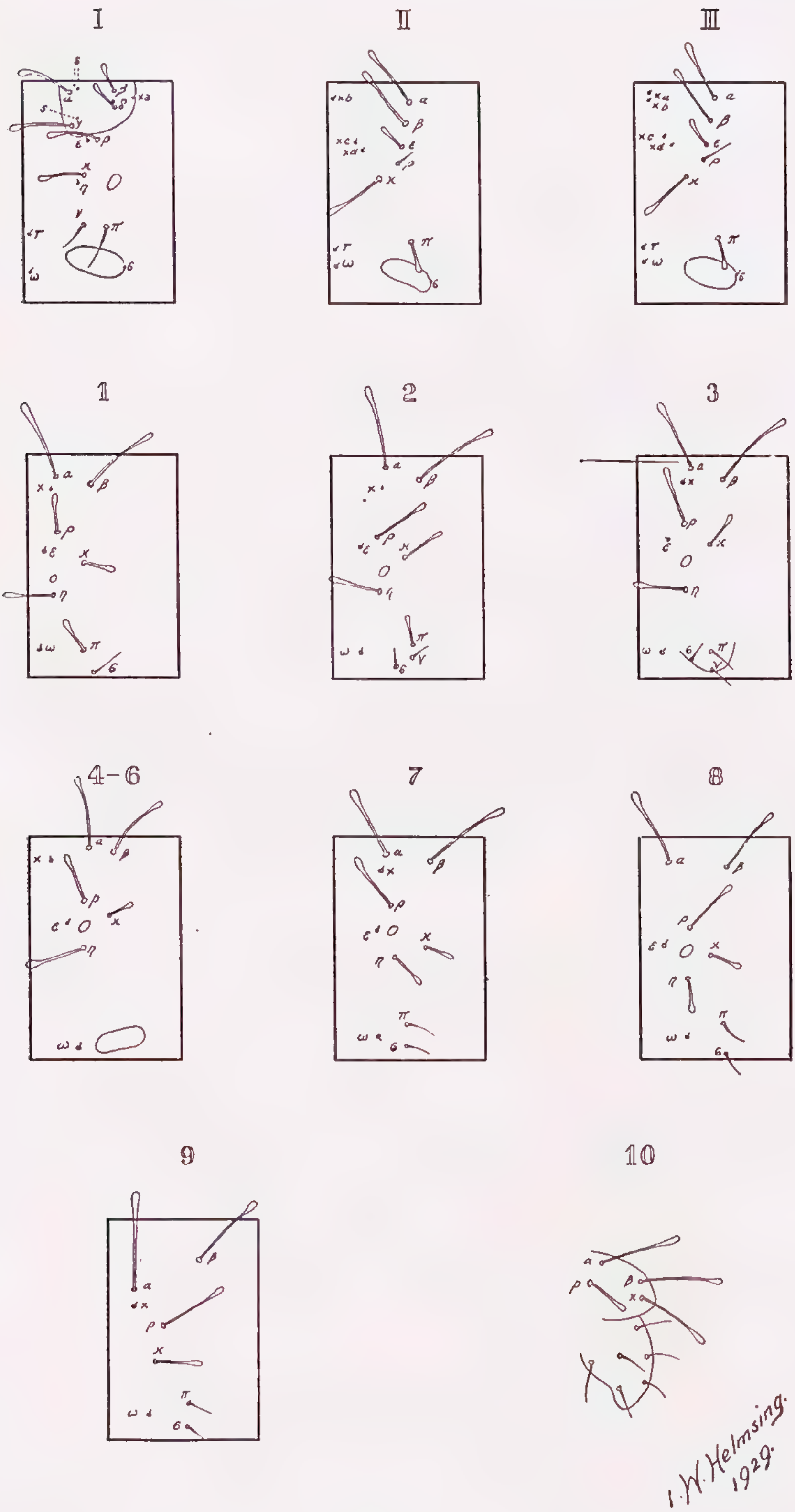


Plate III.

The chætotaxy is the same as in the sixth instar (Plate IV.), and differs from the first instar in the following particulars:—

First thoracic segment.—Substantially the same as in first instar, except some changes in relative position of setæ and the increase in size of sigma.

Second and third thoracic.—As in first instar, with the addition of theta and eta.

First abdominal.—Setæ the same as the first instar, with the addition of mu and nu in the pi group.

Second abdominal.—As first instar, with addition of tau and mu.

Third abdominal.—As first instar, with addition of mu and a larvapod which is still much reduced.

Fourth, fifth, and sixth abdominal.—As in first instar, with addition of mu.

Ninth abdominal.—As in first instar.

The larval skin has very little pigment, faint brown stripes running along the sides being discernible, but the green which shows in the larva is mainly due to the green food contained in the gut.

Third Instar Larva (Plate II., fig. 3).

Head capsule width	·77 mm.
Epicranial index $\frac{F}{ES}$	$\frac{\cdot 30}{\cdot 12} = 2{\cdot}5$
Length of body	6 to 10 mm.
Crotchet formula of larvapods	$\frac{0}{0}\ \frac{4}{5}\ \frac{7}{6}\ \frac{6}{6}\ \frac{9}{10}$

Head capsule colour, brown. Skin light brown. When feeding, a dirty green colour is the result of the green material in the gut showing through. The larva illustrated had an empty gut and was ready to moult, so that its colour was lighter than the normal. The illustration clearly shows the disproportionate size of the head capsule relative to body size, of a larva ready to go into the next instar.

The wide separation of the two sides of the head capsule, showing the cervacoria, and the space between the back of the head capsule and the prothoracic shield, are both signs of an approaching moult. In larvæ not ready to moult the head capsule is usually partly withdrawn under cover of the prothoracic shield.

The chætotaxy is the same as in the sixth instar.

Fourth Instar Larva (Plate II., fig. 4).

Head capsule width	1·21 mm.
Epicranial index $\frac{F}{ES}$	$\frac{420}{150} = 2{\cdot}8$
Length of body	10 to 19 mm.
Crotchet formula of larvapods	$\frac{5}{7}\ \frac{11}{11}\ \frac{12}{13}\ \frac{14}{12}\ \frac{15}{15}$

Colour as in third instar, with a faint red suffusing the dorsum between the brown areas.

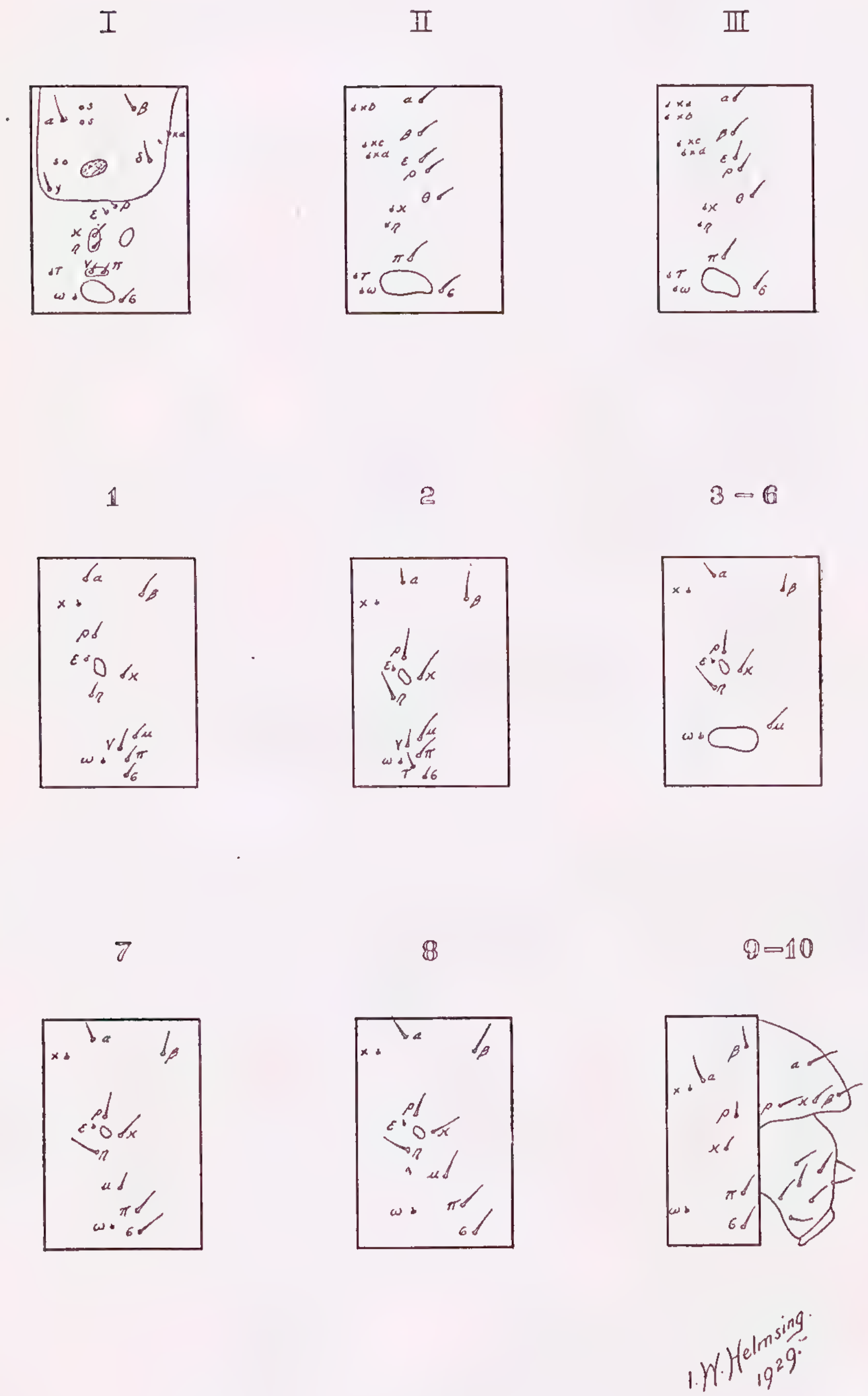


Plate IV.

FIFTH INSTAR LARVA (Plate II., fig. 5).

Head capsule width	1·89 mm.
Epicranial index $\frac{F}{ES}$	$\frac{.840}{.165} = 2{\cdot}9$
Length of body	16 to 26 mm.
Crotchet formula of larvapods	$\frac{8}{10}\ \frac{10}{12}\ \frac{11}{12}\ \frac{13}{12}\ \frac{13}{15}$

Colour as third instar and chætotaxy as sixth instar.

SIXTH (FINAL) INSTAR LARVA (Plate II., fig. 6).

Head capsule width	2·88 mm.
Epicranial index $\frac{F}{ES}$	$\frac{.85}{.2} = 4{\cdot}25$
Length of body	26 to 44 mm.
Crotchet formula of larvapods	$\frac{12}{13}\ \frac{15}{16}\ \frac{16}{17}\ \frac{17}{16}\ \frac{22}{23}$

The colour is a grey-brown often having a reddish tinge. The general colour in all stages when lifted from the soil is affected by the colour of the food in the food canal and by the soil in which the caterpillar is found.

The setæ are relatively large in the first instar but become relatively smaller with each successive increase in size of the larva, so that the sixth instar larva looks quite naked. The spinneret (Plate VII., figs. 1 and 2) is of the same reduced type all through the larval life history. The chætotaxy is illustrated in Plate IV., and is the same as that described in the second instar.

Dyar's Constant.

The Dyar's constant (i.e., ratio between the width of the head of one instar with that of the next instar) varied to some extent between the different instars, and the figures quoted below are the results of averaging 60 individuals.

Dyar's Constant.—	Between first and second instars ..	— 1·6
	Between second and third instars ..	— 1·5
	Between third and fourth instars ..	— 1·57
	Between fourth and fifth instars ..	— 1·56
	Between fifth and sixth instart ..	— 1·52
	Average for the species ..	— 1·55

Pupa. (Colour Plate I., fig. 2) and (Plate V., fig. 1.)

It is a typical noctuid pupa.

The average length of males and females was taken over one hundred individuals.

Females, average length	19 mm.
Males, average length	17·5 mm.

The range in the length of females during the experiment was from 17·5 mm. to 20 mm. and of males from 14·5 mm. to 19·5 mm. The average width of both sexes was about 6 mm.

Plate V., figs. 2 and 3, shows the difference between male and female pupæ in segments 8, 9, and 10 of the abdomen.

The cremaster on the anal segment has two strong, slightly hooked spines, and a variable number of smaller ones. One function of this organ has already been noted. The colour of the pupa is light amber at pupation, but darkens with age to a rich brown.

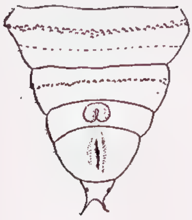
PLATE V.

Euxoa radians Guen.

Fig. 1. Pupa anatomical details.
Fig. 2. Pupa ♂ terminal segments.
Fig. 3. Pupa ♀ terminal segments.
Fig. 4. Mandible of sixth instar larva.
Fig. 5. First instar larva lateral aspect x 15.
Fig. 6. Sixth instar larva lateral aspect x 1½.

Explanation of Fig. 1.

4-10. abdominal segments.
a. antenna.
ao. anal opening.
ce. compound eye.
cr. cremaster.
f. femur of prothoracic leg.
fc. fronto clypeus.
fw. forewing.
g. galea of maxillae.
go. genital opening.
hc. cover of haustellum.
l. labrum.
lp. labial palpus.
t1. tibio-tarsus of prothoracic leg.
t2. tibio tarsus of meso thoracic leg.
t3. tibio tarsus of meta thoracic leg.
v. vertex.



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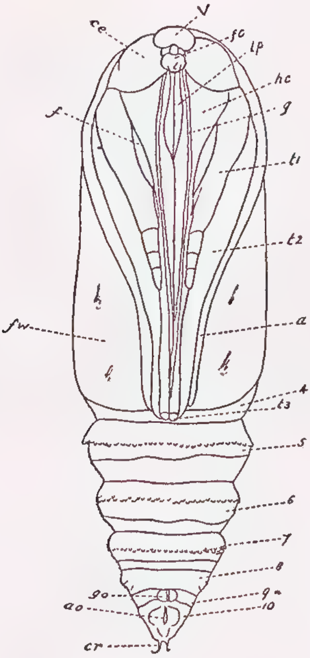

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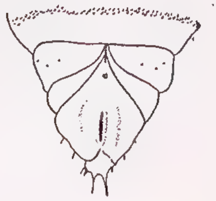

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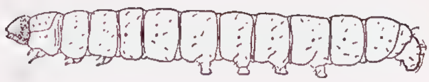

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I. W. Helmsing. 1929.

Plate V.

PLATE VI.

Head capsules of noctuid larvæ.

Fig. 1. *Euxoa radians* Guen., first instar. Cephalic aspect of head.

Fig. 2. *Euxoa radians* Guen., sixth instar. Cephalic aspect of head.

Fig. 3. *Remigea frugalis* Fabr., last instar. Cephalic aspect of head.

Fig. 4. *Agrotis ypsilon* Rott., last instar. Cephalic aspect of head.

Fig. 5. *Spodoptera mauritia* Boisd., last instar. Cephalic aspect of head.

a.	antenna.
a. 1-2.	adfrontal setæ.
adf.	adfrontal sclerite.
ads.	adfrontal sensorium.
adt.	adfrontal suture.
an.	antocoria.
ar.	antennaria.
c. 1-2.	clypeal setæ.
cc.	cervacoria.
cls.	clypeo-labral suture.
cs.	clypeal suture.
ea.	epicranial arm.
es.	epicranial stem.
f.	frons.
fl.	frontal setæ.
fcs.	fronto-clypeal suture.
fs.	frontal sensorium.
l.	labrum.
l. 1-6.	labral setæ.
md.	mandible.
o. 1-3.	occipital setæ.
oc. 1-6.	ocellaræ.
pc.	preclypeus.
po.	post clypeus.
so.	occipital sensoria.
sv. 1-4.	vertical sensoria.
v.	vertex.
v. 1-9.	vertical setæ.

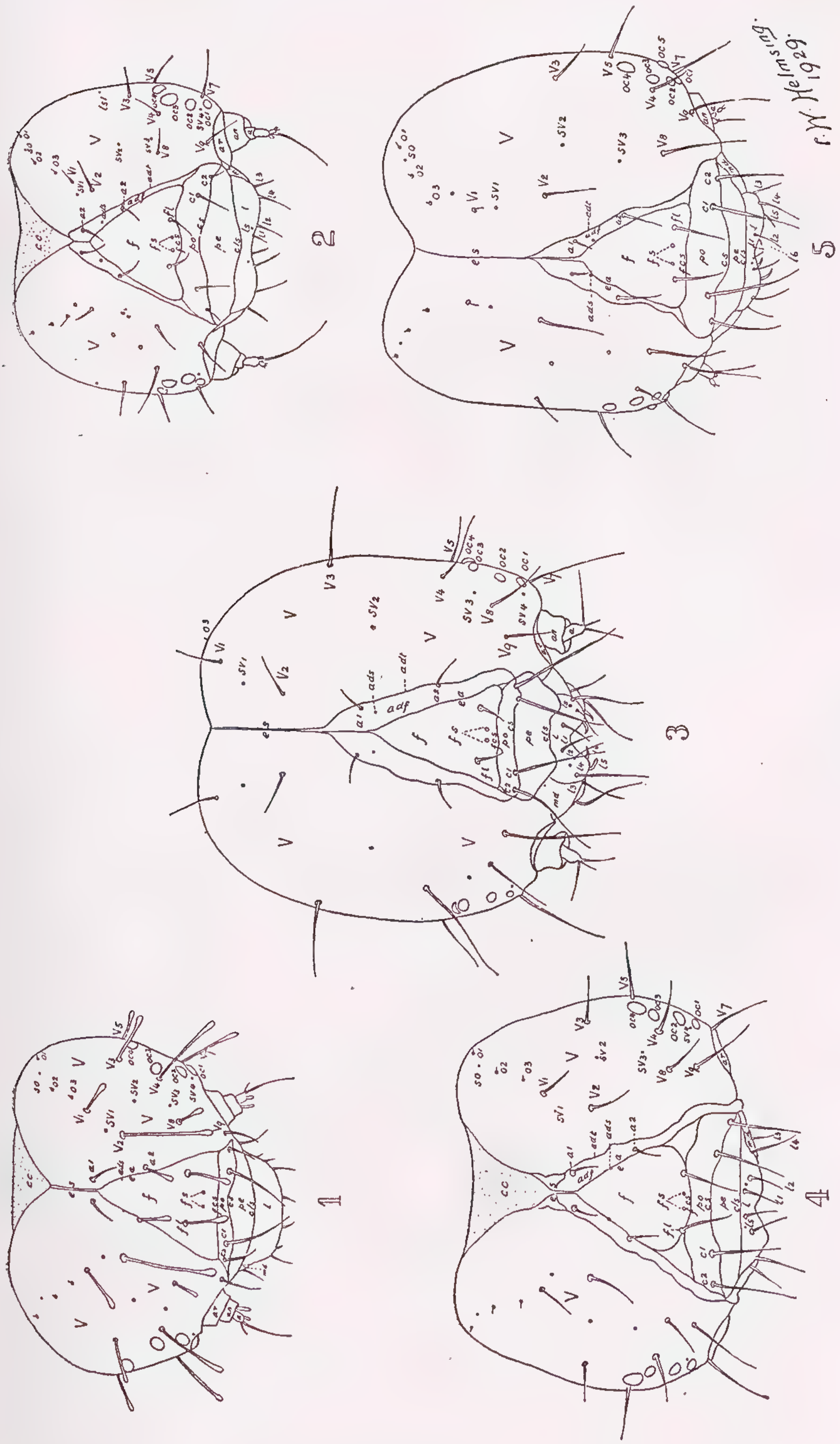


Plate VI.

PLATE VII.

Fig. 1. *Euxoa radians* Guen. Sixth instar, distal portion of labium, caudal aspect x 60.

Fig. 2. *Euxoa radians* Guen. Sixth instar, distal portion of labium, cephalic aspect x 60.

Fig. 3. *Euxoa radians* Guen. First instar, distal portion of labium, latero-caudal aspect x 264.

Fig. 4. *Remigia frugalis* Fabr. Last instar, distal portion of labium, ventral aspect x 60.

hxs. hypopharyngeal setæ.
lp. labial palpus.
siw. lower lip of spinneret.
pp. palpiger.
sis. proximal sclerite of spinneret.
sio. proximal fold of spinneret.
sir. rudimentary fringe of spinneret.
spr. sensoria of palpiger.
sr. sensorium.
si. spinneret.
sp. stipulæ.
sps. stipular setæ.
smt. submental setæ.
sm. submentum.
siv. upper lip of spinneret.

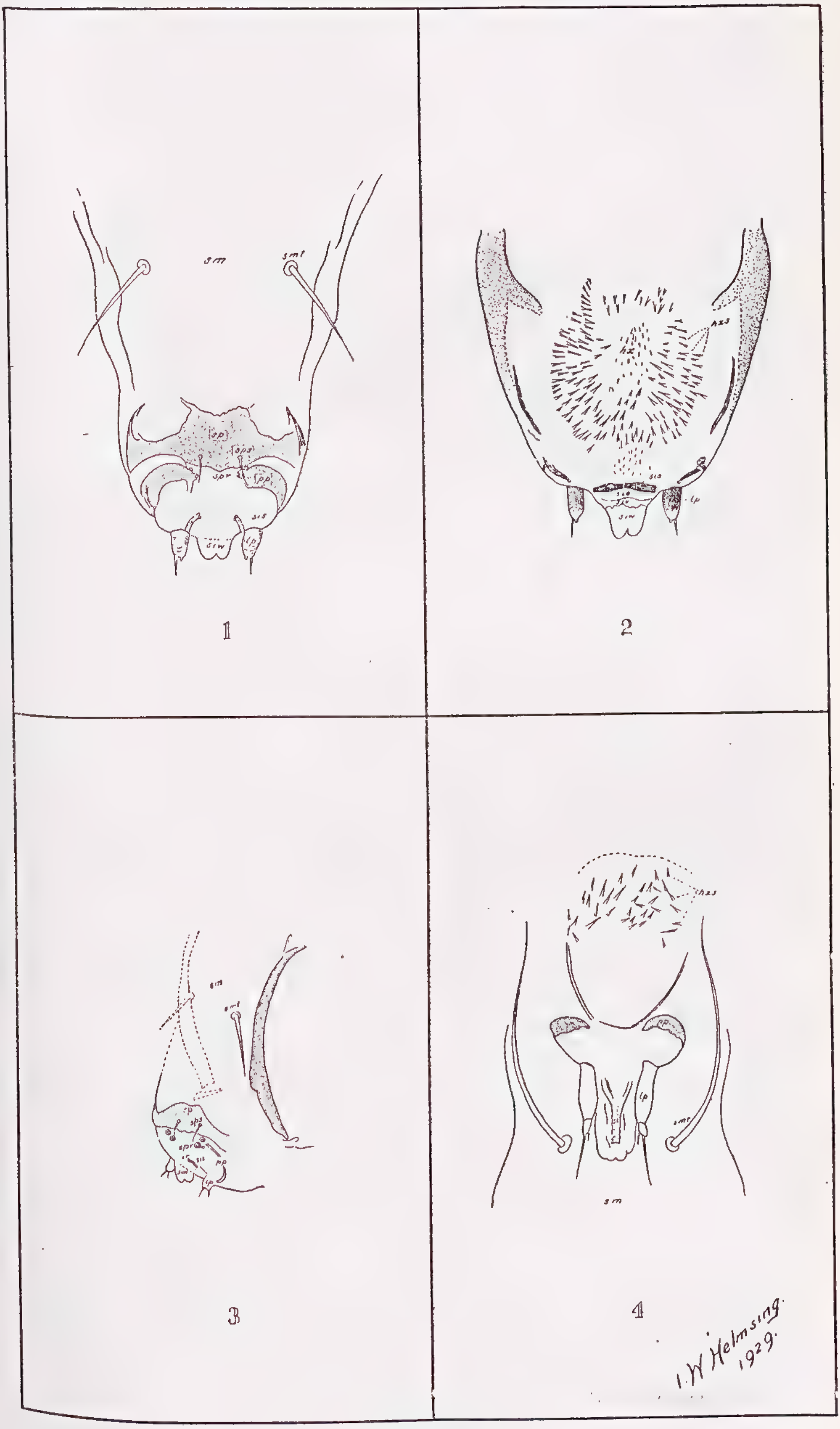


PLATE VII.

COTTON GROWING IN QUEENSLAND.

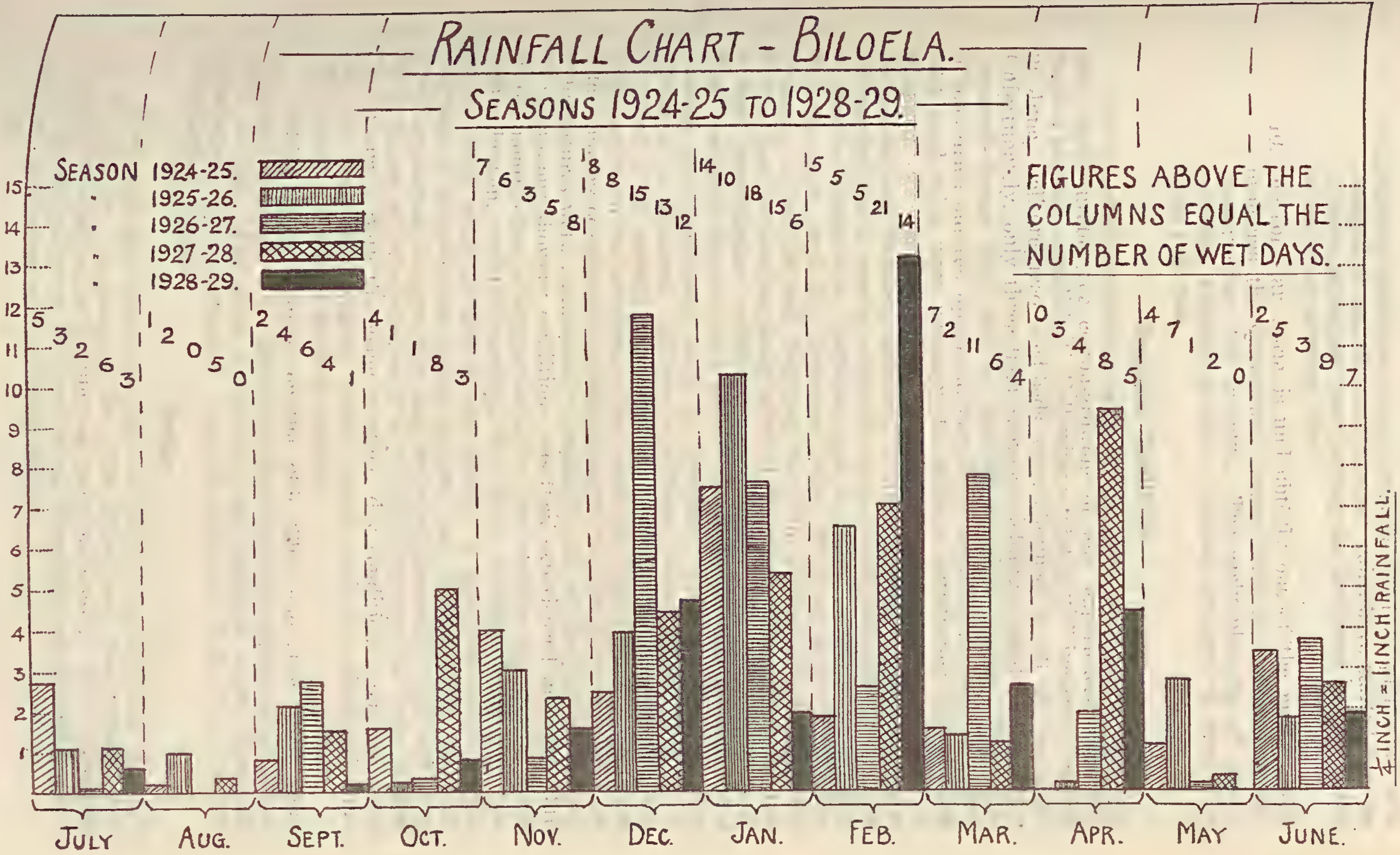
WORK AT THE CALLIDE EXPERIMENT STATION.

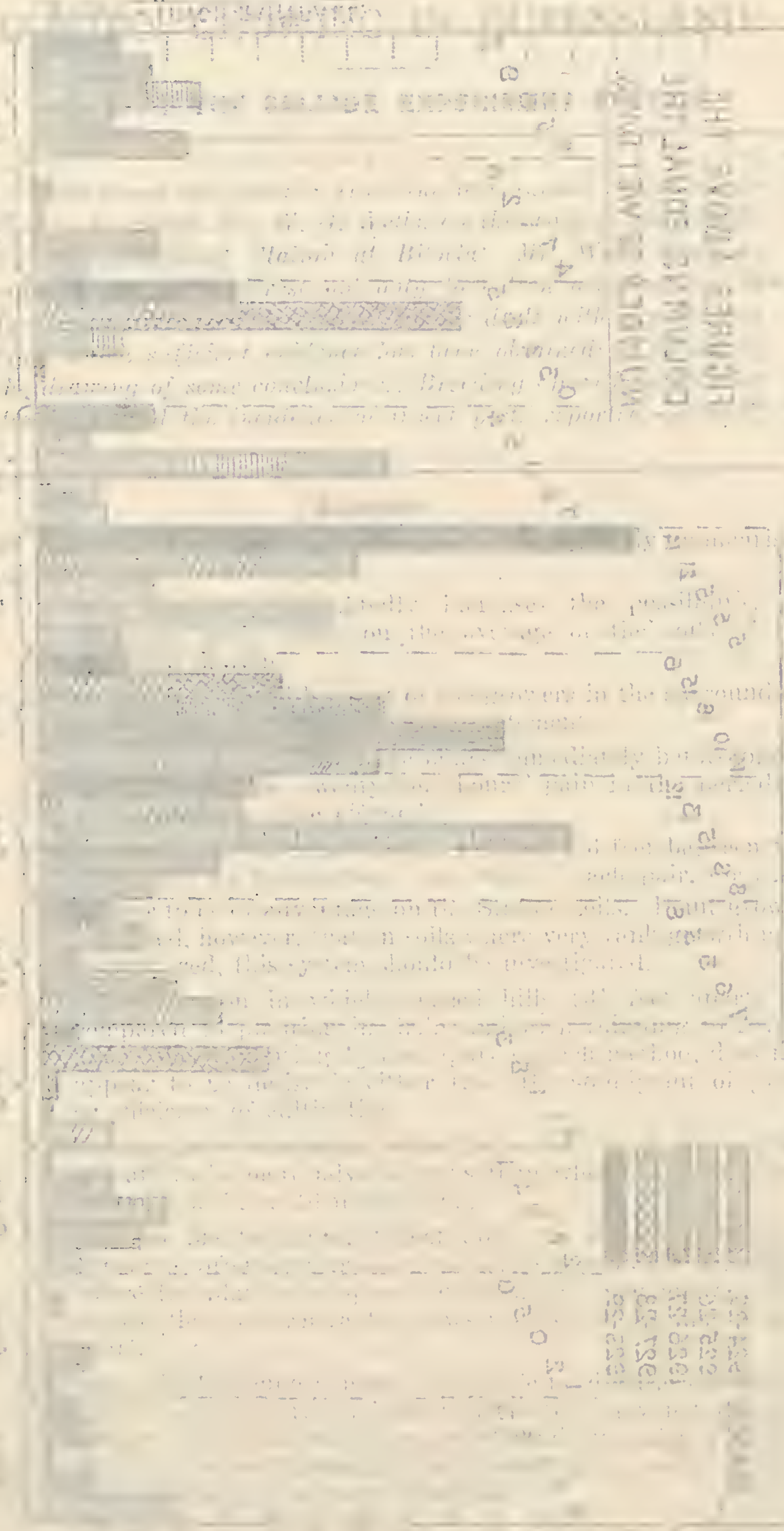
Subjoined are extracts from the last annual report of the Cotton Specialist, Mr. W. G. Wells, on the work of the Callide Cotton Experiment Station at Biloela. Mr. Wells discusses many matters of interest not only to cotton growers, but to farmers generally. His general review deals with experiments from which sufficient evidence has been obtained to permit of the drawing of some conclusions. Breeding operations are also described, and the incidence of insect pests reported.—Editor.

Summary.

THE results of the operations of this season are briefly summarised as follows:—

1. Early planting undoubtedly increases the possibilities of obtaining good yields on the average of the soils of the Research Station.
2. The results obtained by most of the growers in the surrounding district are in keeping with this statement.
3. By soaking the seed for three hours immediately before planting them, a clear twenty-four hours' gain in the period of germination may be effected.
4. Planting late-sown cotton in pairs of rows, 6 feet between the pairs, and 4½ feet between the rows of each pair, does not appear to be of advantage on the Station soils. Plant growth indicated, however, that on soils where very rank growth may be produced, this system should be investigated.
5. Planting cotton in widely spaced hills (3½ feet apart) as compared to planting in drills and then thinning to 2 feet apart, the rows being 4½ feet apart in each method, does not appear to be desirable either from the standpoint of yield or efficiency of cultivation.
6. Thinning late-sown plants when they are 6 to 8 inches high appears to be more advantageous than when they are either 10 to 12 or 14 to 16 inches high.
7. Late-sown plants spaced 1 foot apart in rows 4 feet apart appear to produce a greater number of flowers per acre than where the plants are spaced either 2 or 3 feet apart. This is also the case where the rows are spaced 4½ and 5 feet apart.
8. Such a plant-spacing is more susceptible to climatic variations, however, so the greater flower production may not indicate greater yield obtained. Plant growth indicated that possibly, under less adverse seasonal conditions, wider spacing of late-sown plants may be more beneficial.


RAINFALL CHART - BILOELA.
SEASONS 1924-25 TO 1928-29.
SEASON 1924-25.
1925-26.
1926-27.
1927-28.
1928-29.
FIGURES ABOVE THE COLUMNS EQUAL THE NUMBER OF WET DAYS.
¼ INCH = 1 INCH RAINFALL.
JULY
AUG.
SEPT.
OCT.
NOV.
DEC.
JAN.
FEB.
MAR.
APR.
MAY
JUNE.



9. Applying fertilisers as top dressings when the plants are well established and the early summer rains have started may be of more advantage than putting the fertilisers into the drills before or at planting time.
10. The corn-ear worm is undoubtedly one of the most serious problems the Queensland farmer with late planted rankly grown cotton has to solve. The early planting of cotton, however, appears to offer a decided measure of protection from this pest.

Seasonal Conditions.

The seasonal conditions under review have undoubtedly been the most unfavourable for cotton-growing of any experienced since the Station has been established. Following a total of 2·57 inches of rainfall in June, well-prepared seed-beds were obtained in all of the plots. Unfortunately, only three light showers yielding a total of ·43 inches occurred during July, and no rain fell at all in August. Such conditions dried out the upper surface of the seed-beds to such an extent that good rains were necessary to enable a satisfactory strike being obtained. It was impossible, therefore, to plant on the showers in September and October, although, in areas within a few miles where the precipitations were of a heavier nature, good germinations occurred in sandy or loamy soils. Sufficient rain to enable a strike to be obtained did not occur until 5th November, when ·90 of an inch fell. Unfortunately, no further rain fell until the 19th, so that any irregularities in the depth of planting badly affected the rate of germination, as such a light precipitation evaporated very quickly under the conditions of high maximum temperatures which existed during that period. Good rainfall was experienced early in December, which enabled excellent strikes to be obtained. Showery conditions prevailed from then on to the 25th of the month, after which a dry period accompanied by very high maximum temperatures existed until the 12th January. Scattered light showers occurred from this date until the 7th February, but high temperatures were maintained throughout most of the period. A spell of continuous showery conditions was then experienced until the 23rd of the month, when a long period of hot dry weather again set in, which was unbroken, with the exception of a storm yielding 91 points of rain on the 18th, until the 28th of the month. A good fall occurred then, followed by further rains during the first four days of April. This wet spell terminated the unusually long period of abnormally high maximum temperatures which existed with only slight interruptions from the first of January. With the cooler weather, dry conditions again prevailed and an excellent harvesting period ensued until the middle of June, after which a few light showers occurred.

Killing frosts occurred on the 28th, 29th, and 30th April which destroyed all top growth. Rather low temperatures were then experienced until the 24th May, when a period of four nights of severe frosts was experienced which completely froze all unopened bolls of a size less than half developed.

Cotton.

The yields as a whole have been the lowest that have been obtained on the Station. In many of the plots where very heavy yields have always been obtained, no picking was made this season. The explanation lies in the late planting, followed by an unusually wet February and a series of very severe corn-ear worm attacks.

The rain of the 5th November was just sufficient to obtain a strike under conditions of absolute proper depth of planting and covering of the seed. As some time elapsed before further rain fell, a very irregular rate of germination occured in most plots, and under the existing high temperatures many of the later appearing seedlings died off. This feature was reported generally by the farmers throughout the district who planted on the same rain. Following on the rains of the 4th and 5th December the ungerminated seed in the November planting sprouted. This resulted in a very uneven growth of plant, many of the plots by the end of January having plants 3 feet high adjacent in the same row to the later germinated plants which were only 12 to 18 inches high. This may explain the low yields and rather high degree of corn-ear worm attack which was experienced in the November plantings on the Research Station. In the farmers' crops in the portions of the district where a heavier fall of rain occurred on the 5th November, much better yields were obtained and decidedly lighter corn-ear worm attacks were experienced. Likewise, in previous seasons early November plantings on the Station have given good yields.

The plants made fairly satisfactory growth up to the end of January over the whole of the Station, the early December plantings looking particularly promising. However, under the influence of the two long-pronounced wet periods which occurred in February, nearly all plantings showed a decided tendency to produce an excessive vegetative growth. The situation was further complicated by the high temperatures and dry period which existed during the first half of March. The succulent vegetative growth reacted to such severe conditions, and considerable square shedding occurred. The plants gradually toughened up nicely, however, and might have eventually developed a good crop but for the wet period which occurred from the 27th March to the 4th April, during which around 6 inches fell. This caused a general "bolting" of the plant growth, with the result that much of the Station's crop averaged 5 to 6 feet in height. Corn-ear worm attacks during the latter part of March and early in April further aggravated the tendency to excessive growth. The result of such a combination of adverse conditions, together with early killing frosts, was that the total crop over the whole of the Station was picked by the 8th June, fully a month earlier than usual.

An interesting example of the effect that the condition of the soil may have on the cotton plant was noticed on several low-lying portions of the Station, where the heavy rains caused an accumulation of water for periods of a day or two at a time. In such locations the plants were of a light yellowish green as compared to the dark rich green of the plants over the rest of the Station. They were also shorter and bore very good to even heavy crops of cotton of good quality.

This checking of the growth of late-planted cotton by partial water-logging of the soils has been noticed before on the heavier clay soils in both this valley and in the Wowan and Dululu districts. A sort of physiological drought effect on the plant is produced, which controls the growth to a marked extent and thus allows profitable crops to be produced when the contrary would be expected. Similar results were also obtained this season on the irrigation project at Theodore. There, where the late November crops on clay soils received a heavy soaking irrigation in mid-January, the plant growth was of only moderate development, and much heavier crops were produced than on crops of similar date of planting in the Callide Valley. This was particularly so if the cultivation following the irrigation was unduly delayed. The same

result was not obtained, however, on the rich alluvial loamy soils at Theodore. One late-planted crop on such soil was inspected which had only a few scattered diseased lower bolls. A very rank succulent growth had developed there under the wet February conditions, and an attack by the corn-ear worm had practically destroyed all of the squares formed over the rest of the season.

Fodder Trials.

The testing of different fodder crops to determine which are the most suitable for inclusion in rotation with cotton-growing has again received considerable attention.

As has been pointed out in previous annual reports of the Station, the growing of a winter crop of wheat offers a fairly assured supply of hay of good quality and feeding value. This crop also provides a supply of green feed for the dairyman at the time when the natural grasses have lost much of their food value. Accordingly, varietal tests were again conducted along the lines of the experiment of the previous year, only that the Warren variety was substituted for Warden on account of the susceptibility of the latter to losses from smut.

The following table shows the data obtained from twenty one-sixtieths of an acre plots of each variety; the varieties are arranged in pairs with Florence as the standard in each comparison:—

Variety.	Mean Yield of Sun-Dried Hay in lb. per $\frac{1}{60}$ acre.	Mean Difference.	Value Z.	Odds of Difference being Significant.
Florence	44·19 lb.	2·21	·62	About 150 to 1
Warren	46·4 lb.			
Florence	40·84 lb.	·39	·09	Less than 2 to 1
Roma Red	41·23 lb.			
Florence	48·335 lb.	1·46	·39	19·5 to 1
Warchief	46·86 lb.			
Florence	44·31 lb.	22·86	7·03	More than 10,000 to 1
Skinless Barley	21·45 lb.			

The results of the experiment would indicate that again Skinless Barley has been decidedly inferior to the varieties of wheat tested, as a hay producer. They also indicate that under the seasonal conditions there was no significant difference in the yields obtained in the different wheat variety comparisons except in the Florence-Warren test. In this case, while the difference per plot was small, the statistical treatment by the "student method" gave a very clear indication that under the seasonal and soil conditions Warren was the better of the two varieties, the odds being 150 to 1. As odds of 30 to 1 are considered to be indicative that there is a significant difference in the yielding abilities of two varieties, it can be seen that the results of this comparison were fairly conclusive.

The mean yields of all varieties in the test were decidedly lower than those obtained in the experiment of the previous season. This can be explained by the limited quantity of rainfall which fell during the growth of this experiment as compared to the previous one. Planting was effected on the 23rd June following which 93 points of rain fell

in July in three scattered storms, 17 points in September, and 6 points in October, a total of 1·59 inches during the growing period. A thorough soaking of the seed-bed was obtained soon after the ploughing in April, and 1·64 inches fell in scattered storms during June prior to planting, otherwise it is doubtful if such yields would have been obtained. The previous experiment experienced much better conditions, being planted soon after heavy rain fell early in June, and received 4·56 inches during the growing period, much of which fell when the crop was in the stage of growth requiring ample moisture.

Under the conditions in which this season's experiment was grown, the early maturing variety, Warren, gave good results, and, had the test been planted a fortnight earlier and obtained more benefit of an inch fall then, it is possible that this variety would have showed to better advantage.

Maize.

The testing of maize varieties was again conducted during the past season. The results of the test of the previous season indicated that Improved Yellow Dent obviously required too long a season to be a satisfactory maize for the Callide Valley. Accordingly, only Star Leaming, Funk's 90-day, Reid's Yellow Dent, and Golden Beauty were tried out this season.

Planting was effected on the 14th December and a satisfactory growth was made until the dry heat wave of January was experienced. This decidedly checked the growth of the plants until in all varieties only a stunted weakly stalk was obtained. Under the heavy February rainfall, fairly satisfactory grain was obtained, however.

The results of the experiment, which was in the form of a "Latin square," indicated that there was no significant difference between the yields of any of the four varieties. Star Leaming was the highest yielder (42·4 bushels per acre), and Golden Beauty was the lowest (41·25 bushels per acre).

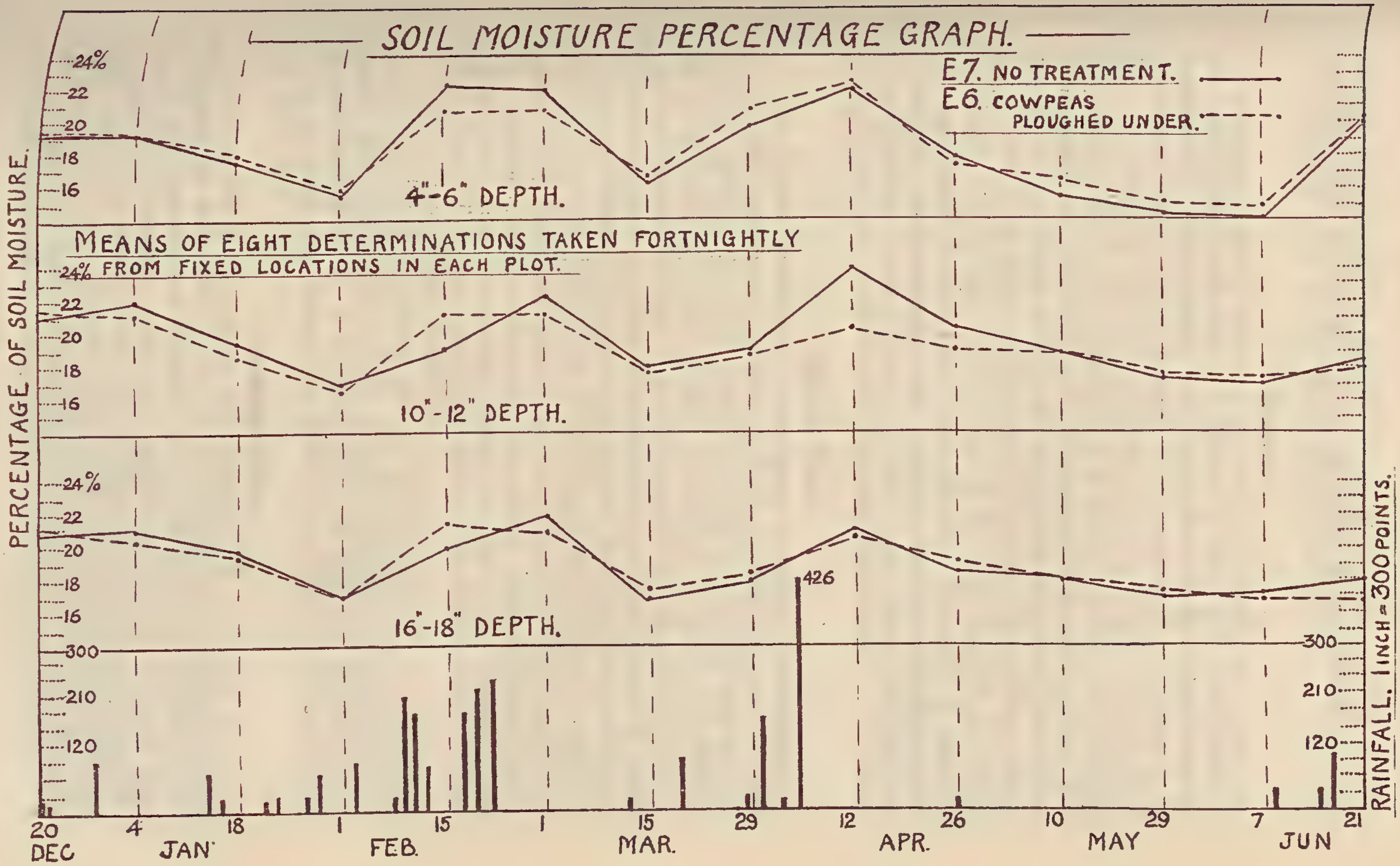
Summer Fodder Crops.

The reliability of the occurrence of the wet season during the months of December, January, and February makes the growing of quick-maturing fodder crops in this period one of the most assured sources of obtaining ample fodder supplies that the cotton-grower in the Callide Valley has. Different crops of this nature are tested out on the Station each season, and the results have always indicated that giant panicum, saccaline sorghum, and Sudan grass can always be relied upon to yield fairly well.

During this past season the plantings of giant panicum made rather slow growths during the dry weather in January, but developed rapidly during the wet weather in February, and yielded on the average around 2 to 2¼ tons of dry hay per acre.

The plantings of saccaline sorghum were mostly on the droughtier soils of the Station and consequently were effected by the dry conditions in January. In spite of this, yields of 12 to 14 tons (green weight) of fodder were made per acre.

Several varieties of Nigerian grain sorghums were also tested for the Instructor in Agriculture of the Central District, but none reached the stage of maturity. It would appear that the combination of a short


SOIL MOISTURE PERCENTAGE GRAPH.
E7. NO TREATMENT.
E6. COWPEAS PLOUGHED UNDER.
MEANS OF EIGHT DETERMINATIONS TAKEN FORTNIGHTLY FROM FIXED LOCATIONS IN EACH PLOT.
4"-6" DEPTH.
10"-12" DEPTH.
16"-18" DEPTH.
PERCENTAGE OF SOIL MOISTURE.
RAINFALL. 1 INCH = 300 POINTS.
24%
22
20
18
16
300
210
120
426
20 DEC
4
JAN
18
1
FEB.
15
1
15
MAR.
29
12
APR.
26
10
MAY
29
7
JUN
21

growing season, and the possible "new place effect" which is often associated with newly imported plants, makes these sorghums of somewhat doubtful value for the Callide Valley conditions.

Lucerne.

The 6-acre plot of this crop gave five cuts during the season, and did fairly well considering the periods of long dry spells which it encountered. Unfortunately, this crop appears to be highly attractive to the early broods of the moth of the corn-ear worm. In each of the past two seasons a migration of large numbers of the corn-ear worm from the lucerne to adjacent cotton plots has taken place. Fortunately, both of these have been noticed early in the day of the commencement of the migration. The laying of a poisoned bait of moistened bran and paris green in a furrow between the lucerne and the cotton, and dusting the infested cotton plants on the ends of the rows with calcium arsenate, effectively controlled the migration. The fact that lucerne is such an attractive breeding place for the first of the large broods makes it of somewhat doubtful value to the cotton-grower. Unless he is prepared to watch for the occurrence of such migrations and have materials which will enable him to control them as quickly as they occur, it is likely that much damage may be encountered by growing lucerne in the vicinity of a cotton crop.

Rhodes Grass.

The 11-acre paddock of Rhodes grass has again demonstrated its value. This was sown in January, 1927, in cultivated land of such droughty nature that cotton crops could not be profitably grown on it. Fortunately, good rainfall was experienced in that month and again in March, so that a very good growth was obtained in the first year. The crop was allowed to mature itself in order to have plenty of seed distributed to replant some misses occasioned by washing during the heavy storms in January. From the late months of that winter until now, fourteen heavy draught horses have had access to this plot, and have been kept in splendid condition with a light supplementary ration of maize and lucerne chaff whenever they were working. Even during the late winter months when the upper parts of the plants are badly frosted a green shoot has been present around the base of the stools, and the horses have fed in the paddock, although they had access to a large adjacent area of natural grasses.

It is believed, therefore, that every cotton-grower in the district should experiment with a small plot of this grass. The plot on the Station is on forest soil of clayey droughty nature, and, if such results can be obtained on it, it would appear that this crop offers a cheap source of green food during the period when the native grasses have lost their food value.

Rotation Series.

The results obtained from this series of crop tests have been very disappointing this season as regards yields in the cotton borders. Owing to the late planting and irregular rate of germination, excessive plant development occurred, which was aggravated by loss of crop from attacks by the corn-ear worm. All of the yields of cotton were unprofitable, and were so low that the effects of the cotton crops on the different systems of rotation will probably not be truly representative. The various rotations will be continued during the coming season, however, along the lines which have been planned.

Cotton Experiments.

The majority of the experiments of this season have been badly affected through irregular time of germination, terminal loss, hail damage and, in most cases, corn-ear worm attack. The yields in many have therefore been of little value and have not been considered. In some of such experiments, however, the plants of the first germinations developed fairly normally and it appeared possible to obtain some information on such characters as average boll weight, number of 4- and 5-locked bolls per plant, &c. This was deemed desirable in order to add to the data being collected in the different experiments, many of which are being conducted over a series of years. These have been fully described in previous annual reports of the Station, so only the data obtained this season will be discussed in an experiment.

The method used this season to obtain material for examination was to select a number of plants in comparable positions in each border. These locations were spaced at regular intervals on a staggered basis in the three inner rows of each plot of each treatment. The only selection exercised was when the plant at the selected position number had lost its terminal or was adjacent to a blank space, in which case the nearest suitable plant with a terminal was taken.

Time of Planting Experiment.

The adverse climatic conditions prevented the regular programme of monthly plantings, starting in September, from being carried out in the first two months. Accordingly the experiment was re-designed so as to compare early and late November plantings with early and late December ones. Only one November planting was obtained, however, that being made on the 8th of the month. One planting was obtained on the 11th December and another on the 19th of that month.. Unfortunately a delayed complete germination was obtained in the November planting, so the yields are not really true indicators of the possibilities of an early November planted crop on the Station soils.

The early December rains allowed of a good strike being obtained for that month's plantings of the experiment. Rapid growth was made in the two earlier plantings during December, but under the prolonged period of high temperatures during early January the plants toughened up and gave excellent promise of producing profitable crops. The plants of the 11th December sowing were of an especially fine type, and by the end of January were easily the most promising of any ever produced in the December plantings on the Station.

The November planting flowered considerably earlier than did the later ones, flowering being fairly regular by the 6th February in the former whereas it was not until the 18th of the month that flowers in any quantity could be seen in the later sowings. The flower counts for February indicate that the early December planting produced only 25 per cent. as many as did the November planting, and the late December produced only 8 per cent. During March the figures improved, but even then the early December planting produced only 51 per cent. as many flowers as did the November one, while the late December sowing produced only 38 per cent. of the production of the earliest planting.


SEASON 1928-29
Rainfall and Temperature Chart
Biloela
Temp. Three Day Means {Maximum / Minimum
Rainfall-Three Day Totals.
Maximum Temperatures.
Minimum Temperatures.
Killing Frosts.
Killing Frosts.
Points of Rain
500
450
400
350
300
250
200
150
100
50
40
30
20
10
Temperature in Fahrenheit Scale.
100°
95°
90°
85°
80°
75°
70°
65°
60°
55°
50°
45°
40°
35°
30°
25°
20°
July
August
September
October
November
December
January
February
March
April
May
June

Generally speaking, by the 20th of February the November plants were carrying a nice crop of bolls and squares. Following the rainy season, however, excessive vegetative growth developed, which in conjunction with the severe corn-ear worm attack caused nearly a complete loss of squares and even the destruction of most of the lower bolls. Bolls started opening by the beginning of March, but it was not until the 21st of the month that opening was general. The plot was not picked until the 18th May in order to obtain all of the crop in the one picking. The yield was at the rate of 167 lb. per acre.

The 11th December planting entered February in excellent condition, and had only moderate rainfall been experienced in that month it is possible that this planting would have yielded heavily. The excessive rainfall of February, however, forced a very luxuriant growth in this planting, with the result that square shedding was severe. A very heavy corn-ear worm attack was also experienced during February, March, and April, so that practically no bolls set over the upper portions of the plants. The crop of bolls developed was so light that no picking was made until the 7th June, when a yield at the rate of 81 lb. per acre was obtained.

The late December planting was practically an entire failure with only a few scattered open bolls which were not harvested.

The results are in keeping with those obtained in the Time of Planting Experiment of previous seasons. While the November planting was made early enough to have given much heavier yields, the delayed germination really gave plant growth more similar to late November plantings of previous seasons. Comparable returns were also obtained by farmers on similar soils adjacent to the Station. In contrast to these, however, excellent yields were obtained within a few miles of the Station. These sections received storms during the latter half of October which allowed planting to be accomplished, and the early November rains thoroughly established the seedlings. The results over a series of seasons, therefore, indicate that September and October plantings offer the best chances of obtaining profitable yields in the Callide Valley.

The growers should make every effort, therefore, to establish early well-prepared seed-beds in order to be able to obtain a strike on the first planting rains of the season. The figure in this report illustrating the monthly rainfall at the Research Station for the last five seasons clearly indicates that sufficient rain occurs in June to enable a seed-bed to be prepared during that month. It is believed, therefore, if the growers plan their operations so as to enable ploughing to be done in early July, that much of the difficulty of obtaining early strikes will be overcome. Certainly, seasons will occur, such as this past one, where even well-prepared seed-beds will not allow of obtaining a strike owing to scanty rainfall. It is pointed out, however, that this is the first season in the six that the Research Station has been established, in which it has not been able to obtain a strike in late September or early October on early well-prepared seed-beds. An examination of the rainfall figure will show that the precipitations have been very light in September, so it is believed that early planting can usually be accomplished if the proper methods are used. As early planting seems to be correlated with heavy yields and escape from corn-ear worm attacks, it is believed that this is the key-point to successful cotton-growing in the Callide Valley.

Hill versus Drill Planting Experiment.

The merits of planting cotton in hills wide enough apart to allow of cross-cultivation, as compared to the usual method of planting in drills and later thinning out the plants to a distance of 2 feet apart, is of especial interest in a season like the one just completed. In the previous season the experiment on this subject was planted early and gave promise of yielding some interesting information. Unfortunately, through a misunderstanding at harvesting time, the plot was picked in such a manner as to make the yields obtained of little value.

The flower counts of that experiment clearly indicated, however, the yielding possibilities of the two systems. During the first 12 days of the flowering period which commenced on the 19th December, the single plants in the hills which were spaced 3½ feet apart in rows 4½ feet apart produced only 58·3 per cent. as many flowers as did the 2-foot spaced single plants in the same row spacing. During January the wider spaced plants gained somewhat, but still produced only 73·4 per cent. as many flowers as did the other treatment. The wet conditions in February accelerated the growth of the larger plants, however, with the result that they produced about the same number of flowers as did the 2-foot spaced plants. The flowering in the wider spaced plants fell off after this, only 94·8 per cent. as many flowers being produced in March as in the closer spacing.

The experiment of this season was planted 32 days later than was the one of last season. This caused a delay in the start of general flowering until the 21st of January as compared to the 19th December in the previous experiment. The wide-spaced plants did not produce as many flowers as did the closer-spaced ones in any of the three months in which the observations were taken. The numbers of flowers of the wide-spaced plants were of the following percentages of the 2-foot spaced plants:—January 47·3 per cent., February 72·0 per cent., March 70·2 per cent. These compare with the following percentages for the preceding season:—January 73·4 per cent., February 101 per cent., March, 94·8 per cent. It would appear, therefore, that the 3½-foot spacing between the plants was not as conducive to producing flowers per given area of row as was the 2-foot spacing. It would also appear, for the two seasons under review, that, when the crop is planted late and experiences a wet season, the difference in flower production between the two spacings is all the more pronounced than when the crop is planted early.

Owing to the severe maize-grub attacks which were experienced in this section of the Station, the yields were so low that no reliable data could be obtained from them. A portion of the plots where sufficient cotton was present as to afford some idea of the yielding abilities of the spacings was picked, however, although simply as a bulk picking of six short rows of a total area of approximately one-eighth of an acre of each treatment. It is recognised that such data are of little value, but the fact that in these two plots the 2-foot spacing yielded 100 per cent. heavier, being at the rate of 832 lb. per acre as compared to 416 lb., would indicate that probably the closer spacing would have produced at a heavier rate over the whole of the experiment but for the maize-grub attack.

In order to afford material for an examination of the effect of the spacings on the individual plant, 30 plants were selected, in the manner as previously described, in each treatment in the plots which were harvested.

The table records the data obtained from the material collected.

DATA REFERRING TO BOLL FORMATION AND WEIGHT OF BOLLS (GRAMMES) IN HILL VERSUS DRILL PLANTING EXPERIMENT.

—	Drill.				Hill.			
	Mean.	P.E.	S.D.	P.E.	Mean.	P.E.	S.D.	P.E.
Number of 5's ..	4·8	± ·35	2·82	± ·25	5·27	± ·35	2·82	± ·25
Number of 4's ..	6·4	± ·47	3·8	± ·35	6·03	± ·40	3·27	± ·28
Green 5's	·53	± ·09	·72	± ·06	1·13	± ·20	1·65	± ·14
Green 4's	7·6	± ·70	5·7	± ·50	6·6	± ·60	4·54	± ·40
Total number of bolls	24·47	± 1·02	8·32	± ·72	23·87	± 1·24	10·06	± ·88
Total S/c. per plant ..	91·28	± 4·34	35·21	± 3·07	85·99	± 3·39	38·88	± 4·79
Number of bolls per lb. S/c.	72·75	± 1·62	13·19	± 1·15	75·33	± 1·07	8·68	± ·76
Average weight 5 ..	6·94	± ·12	·92	± ·08	6·59	± ·11	·92	± ·08
Average weight 4 ..	6·07	± ·12	·92	± ·08	5·36	± ·20	1·59	∓ ·14

Drill: Dif. average weight of 5 and 4-locked bolls = ·87 ± ·17 grammes. $\frac{D}{E} = 5\cdot1$

Hill: Dif. average weight of 5 and 4-locked bolls = 1·23 ± ·23 grammes. $\frac{D}{E} = 5\cdot35$

The data would indicate that there was no significant difference between the two spacings in any of the plant characters examined. In each treatment, however, the average weight of a 5-locked boll was significantly greater than that of the 4-locked boll. The difference was greater in the hill spacing, but this may have been caused by the considerably higher variation between the plants in this treatment, the coefficient of variability* being approximately twice that in the drill spacing.

The notes taken during the growth of the experiment indicate that the plants in the hill treatment had a heavier vegetative development and tended more to lodge. This latter feature was present last season in both a similar experiment and one in which different numbers of plants were left in hills spaced 3½ feet apart. This tendency to lodge prevents close working to the plants in the later cultivations, and thereby defeats the purpose for which the wide spacing is intended. Based on the results obtained for the two seasons it would appear questionable if there is any advantage to be gained by such wide spacing of the plants, as far as cultivation is concerned, and it may be possible that lighter yields will be obtained if this practice is followed.

Height of Thinning Experiment.

This experiment was planted following on the rain of the 8th November, but unfortunately suffered a variable germination in common with the rest of the plantings at this date. The yields, therefore, are of little value, although those obtained from two "Latin Squares" of this experiment indicated that the latest thinning produced the lowest yield. The variation in age of the plants makes the yields unreliable, however,

* Coefficient of variability $= \frac{SD \times 100}{M}$

so only the flowering data and the material from 60 selected plants in each treatment will be considered. The plants were selected by the method previously described, so it is believed that the results are truly representative of the three treatments under the conditions in which they were grown.

The thinnings were performed when the plants were 6 to 8, 10 to 12, and 14 to 16 inches tall, to a distance of 24 inches apart, one plant to a space. Observations on the 24th January gave the impression that little difference existed between the two earlier thinnings, but the effect of the delayed thinning during the favourable growing conditions in December had given the 14 to 16 inch thinning a decided "spindly" appearance, with practically no bottom crop. The effect of the prolonged high temperatures and lack of rain was noticeable in all three treatments, the fruiting branches produced during that period showing a decided shortening of length of internodes as compared to the rather long internodes produced during the luxuriant growing conditions.

Owing to the variation in stand and the loss of terminals from a hailstorm, it was believed that the usual flower counts in the centre rows of each plot would be of little value. In an effort to obtain as much information as practicable on this factor, it was decided, therefore, to select 20 plants in each plot of each treatment by the same method as was used in selecting the plants from which to obtain material for boll weight determinations, &c. Accordingly, daily flower counts were made on 120 plants in each treatment, and the following data were obtained:—

FLOWER COUNTS OF HEIGHT OF THINNING EXPERIMENT.

Treatment Height.	30th January to 28th February.	Per Cent of Total.	Rest of Season to 4th April.	Total.	Percentage based on 6 to 8 as 100.
6 to 8 inches	3,147	61·5	1,979	5,126	100
10 to 12 inches	2,641	56·3	2,049	4,690	91·5
14 to 16 inches	2,129	53·5	1,851	3,980	77·8

It would appear, as was the case last season, that the earliest thinning was conducive to an early formation of the fruiting branches and thus allowed of a heavier production of flowers during the first period of flowering. In the previous season this advantage was overcome, however, as the later thinnings produced higher total numbers of flowers for the season. The explanation of such a result appeared to lie in the fact that, under the favourable seasonal conditions during the early growth of the plants, a rather vegetative development occurred in the early thinned plots. Considerable shedding of squares took place on this growth during unfavourable conditions in January and February, which thereby reduced the later flowering. There was a tendency to produce flowers in somewhat similar manner this season, but the flowering season being so much later than in the experiment of last year, the later thinned plants could not overcome the initial advantage of the early thinned ones.

The data obtained from the boll material collected from the 60 selected plants in each treatment can best be summarised in the manner set out in the accompanying table:—

BOLL DATA FOR HEIGHT OF THINNING EXPERIMENT.

Total number of bolls per plant	Most on the earliest thinning ; least on latest one. Differences not significant statistically.	
Number of bolls per lb. of seed cotton	Differences irregular. Differences not significant statistically.	
Harvested bolls expressed as per cent. of total crop per plant each treatment	6 to 8, 55·7 per cent. 10 to 12, 54 per cent. 14 to 16, 47·3 per cent.	
Average weight seed cotton per plant	Most on the earliest ; least on latest. Difference between— 6 to 8 and 10 to 12 treatment, not significant, $\frac{D}{E} = 1{\cdot}43$ 6 to 8 and 14 to 16 treatment, significant, $\frac{D}{E} = 4{\cdot}10$ 10 to 12 and 14 to 16 treatment, not significant, $\frac{D}{E} = 2{\cdot}47$	
Difference in number of 5- and 4-locked bolls per plant harvested in each treatment	Treatment— 6 to 8—Slight tendency for more 5's, not significant. 10 to 12—Greater tendency for more 4's, $\frac{D}{E} = 2{\cdot}39$ 14 to 16—Significant tendency for more 4's, $\frac{D}{E} = 5{\cdot}0$	
Difference in number of 5- and 4-locked green bolls per plant unharvested	Treatment— 6 to 8—Highly significant in favour of 4-locked $\frac{D}{E} = 9{\cdot}26$ 10 to 12—Highly significant in favour of 4-locked $\frac{D}{E} = 10{\cdot}7$ 14 to 16—Highly significant in favour of 4-locked $\frac{D}{E} = 11{\cdot}0$	27 per cent. 5-locked 22 per cent. 5-locked 25 per cent. 5-locked
Difference in average weight of 5- and 4-locked bolls per plant	Treatment— 6 to 8—Highly significant in favour of 5's $\frac{D}{E} = 9{\cdot}43$ 10 to 12—Very significant in favour of 5's $\frac{D}{E} = 6{\cdot}95$ 14 to 16—Highly significant in favour of 5's $\frac{D}{E} = 9{\cdot}15$	4's, 83 per cent. as heavy 4's, 83 per cent. as heavy 4's, 83 per cent. as heavy
Percentage of the average number of 5-locked bolls of the average total number of bolls per plant	Treatment— 6 to 8—26·9 per cent. 10 to 12—20·9 per cent. 14 to 16—20 per cent.	

It would appear from the above data that, under the conditions in which the experiment was conducted, the earliest thinning gave these advantages:—A few more bolls per plant; a slightly larger percentage

matured by time of first frosts; slightly more seed cotton than in the 10 to 12 treatment, and significantly more than in the 14 to 16 inch thinning; a higher percentage of 5-locked bolls of the total number of bolls borne per plant; and a higher percentage of 5-locked bolls in the bolls harvested.

The results would indicate, therefore, that the heavier rate of flowering observed in the earlier thinnings during the first period of flower counting was apparently to the advantage of these thinnings, in that a better yield was obtained by the time of the first killing frosts. This advantage in yield can be explained by the fact that, not only was there a higher percentage of bolls matured, but also there was a greater percentage of 5-locked bolls in the crop harvested. As the 4-locked bolls weighed only 83 per cent. as much as the 5's, it can be seen that this would materially influence the yield.

The results are different in some respects to those obtained last season in a similar experiment. Then, the total number of harvested bolls per plant ascended in favour of the later thinnings. The number of 5-locked bolls per plant averaged about the same in each treatment, but there was a significant difference against the 6 to 8 height of thinning in the number of 4-locked bolls per plant between the 6 to 8 and 10 to 12 treatments (D over E = 3·85), and between the 6 to 8 and 14 to 16 treatments (D over E = 4·4), and just hardly a significant difference in favour of the 14 to 16 inch thinning as compared to the 10 to 12 treatment (D over E = 3·05). The percentage of 5-locked bolls of the total number of bolls harvested per plant in each treatment was somewhat of the same order as in this season, with the exception that the 10 to 12 treatment had a higher percentage than did the 6 to 8: the figures are 6 to 8 27·9 per cent., 10 to 12 30·4 per cent., and 14 to 16 25·8 per cent. There was not such a range between the treatments as was the case this season.

The results obtained from the experiment for the last two seasons would indicate that thinning when the plants are 6 to 8 inches in height is conducive to the early development of the fruiting branch structure. This allows of the earlier production of flowers, and gives this height of thinning an advantage over the other heights tried. In a late planted crop this is of decided value, as a larger number of bolls will be harvested if early frosts occur. Apparently, in a late planted crop, there is a higher percentage of 5-locked bolls developed in the earlier maturing bolls of the 6 to 8 inch thinning than in either of the other two treatments. As the weight of the 4-locked bolls in the late planted experiment of this season averaged around 83 per cent. of the weight of the 5-locked, and from 84 per cent. to 90 per cent. in early planted plots of the previous season, it would appear that this greater percentage of 5-locked bolls in the earlier formed bolls is of decided advantage, especially in a short season.

Insect Problems.

Insect pests affected the yields obtained on the Station this season more than has been the case in any previous crop. The outstanding one was the corn-ear worm which completely destroyed the top crop of squares on all the late-planted cotton. Other insects present and causing varying amounts of damage were thrips, pink boll-worm, rough boll-worm, and the sucking bugs.

THRIPS (*THRIPS TABACI* LINDEMAN).

This insect was present during the early stages of the plant growth, and caused serious loss of terminals in many of the November planted plots. It was also present in the December planted plots, but to a much lesser degree. As in previous seasons, the presence of this insect after November appears to be correlated with the amount of rainfall. Under good rainfall there is but light infection in December, but when the precipitation is scanty in this month damage may be done even on plants a foot or more high.

CUTWORMS (*EUXOA RADIANS* GUEN.).

Owing to the fact that there was no cotton planted on the Station in either September or October, it cannot be stated if cutworms were present during this past spring. No reports were received of serious damage in the immediate district where October planting was obtained, so it is not believed that this pest was present in sufficient numbers to be of economic importance.

CORN-EAR WORM (*HELIOTHIS OBSOLETA* FABR.).

The Station suffered from attacks by this pest, the worst of any year since it has been established. The explanation appears to lie purely in the fact that all of the plots were late planted. The experiences of previous seasons have all demonstrated that late-planted crops on the Station soils are liable to attacks from the corn-ear worm. The conditions during this past season have been eminently suitable for heavy occurrence of this pest, and the losses received were to be expected.

Each season supplies evidence that damage from corn-ear worms and late-planted crops on rich alluvial loamy soils are very closely correlated. Exceptions occur, of course, but generally speaking this is true. Late-planted crops on clay soils, however, appear to be fairly free from atttack to an amazing extent. The explanation appears to lie in the nature of the plant growth. On rich alluvial loams the late-sown plants make a rapid sappy vegetative growth if the climatic conditions are at all favourable. On clayey soils, crops planted at the same time and receiving similar rainfall usually make a much slower and tougher growth which apparently is not attractive to this insect.

The lucerne plot on the Station was again the source of an invasion from the corn-ear worm. On the 31st January a migration of grubs similar to that of last season crossed the 18-foot roadway into E. block. This followed a rapid drying off and wilting of the lucerne. Bran, paris green, and molasses bait was scattered down the road, and in the cotton rows at right-angles to the road the plants for a distance of a chain were hand-picked of all larvæ. The measures taken were entirely successful. The emergence of moths responsible for this brood commenced following the 2·55 points of rain on the 4th and 5th December.

PINK BOLL WORM (*PLATYEDRA GOSSYPIELLA* SAUNDERS).

The light yields caused by the late planting and heavy corn-ear worm attacks prevented an examination of any value from being made in the plot which is annually examined for pink boll-worm. It was thought advisable, however, to attempt to obtain some data regarding the presence of this insect this season. Accordingly, 200 bolls were examined in a plot in the same portion of the field and only one worm was found. This was not a comparable test to the one of the previous

season, so no significance can be attached to the result. An isolated progeny increase planting in the orchard plot on top of the hill was also examined. This plot was adjacent to soft vine scrub and lay in line between the location of the first cotton plot ever planted in the district, and the bulk of the Station plots. As it is thought that the site of the first crop might be the original source of infection for the district, it was considered the progeny plot might show results of interest.

The material used for this examination was off-type plants which had been pulled up in the breeding operations. Ninety plants were taken, which came from all parts of the plot, which was about one-third of an acre in area. A total of 1,798 ripe and 2,658 green bolls were examined on those plants and the following numbers of pests obtained:—Pink boll-worm, 90; rough boll-worm (*Earius huegeli*), 28; and Peach sometimes called Maize Grub (*Conogethes punctiferalis* Gn.), 21. The number of pink boll-worms does not mean that percentage of boll infestation, however, as several bolls contained 2 worms and three bolls 3 worms. Unfortunately, the records were not taken so as to give the actual percentage of attacked bolls. Of the ninety plants examined, twenty-five did not have a pink boll-worm.

The results obtained in this inspection made it appear desirable to examine a crop in some other portion of the district. Accordingly, a field in the centre of an alluvial flat and some 12 miles from the Station was examined. Unfortunately, it was late in the season and only the green bolls of the upper part of the plants were available. The material is therefore hardly comparable with that obtained in the Station plot. The procedure adopted here was to select scattered well-laden plants over the field, which covered approximately 10 acres. As in the orchard plot on the Station, every boll was taken off each selected plant and thoroughly examined. A total of 2,300 bolls were inspected in this manner and the following worms found:—Pink boll-worm, 45; rough boll-worm, 18; peach grub, none. Seventy-two plants were examined, and thirty-six did not have a pink boll-worm in the green bolls.

During the above-described examinations a factor was observed which may have a decided bearing on the control of the pink boll-worm. It was noticed that in a considerable number of the attacked bolls the shrivelled form of the pink boll-worm still remained. Often a small whitish cocoon was found adjacent to it. This led to a close examination of the live larvæ which were found, and one was obtained which had three eggs laid on the back around the head. These eggs were hatched out but unfortunately the larvæ went into cocoons before they were noticed. The cocoons appeared to be identical with those found in the attacked bolls. Through an accident the three cocoons were destroyed, so some of the cocoons found adjacent to the parasitised pink boll-worms were forwarded to the Chief Entomologist at Brisbane. He has kindly advised that what appears to be a species of *Apanteles* emerged from these cocoons.

It would appear, therefore, that the population of pink boll-worms is not a serious economic factor in the Callide Valley at present. The presence of so many in a small plot near the softwood scrub indicates, however, that very careful methods of cleaning up the cotton crop should be exercised at the end of each season. This clean-up should be performed as early as possible, as many of the larvæ were found in the old diseased bolls, and an early destruction of the plants would have killed most of them.

SUCKING BUGS.

The False Stainer (*Aulacosternum nigrorubrum* Dall.) was present in larger numbers throughout most of the season than has ever been the case in previous crops on the Station. In fact, it appeared to be in as large numbers during the latter part of the season as was *Dysdercus sidæ.* It may be possible, therefore, that it is responsible for some of the punctures which in the past have been laid to *Dysdercus* and *Tectacoris lineola.* The fact that it occurs in large numbers during the squaring season, when there are practically no bolls on the plants, may also indicate that it is responsible for some of the square shedding, or, possibly, the peculiar late loss of terminals which has been experienced in the last three seasons.

The Harlequin Bug (*Tectacoris lineola* F.) was not seen until the 3rd February. Shortly afterwards, small numbers of both sexes were seen and a few clusters of egg colonies were found. This insect was hardly noticeable during the rest of the season, and was in even fewer numbers than in the previous season.

The large and small Stainers (*Dysdercus sidæ* Montr. and *Oxycarænus luctuosus* Montr.) were present, but in light numbers.

FRUIT FLY IN JAVA—A CORRECTION

In an article entitled "The Banana Weevil Borer in Java, with Notes on other Crop Pests," published in the Agricultural Journal of December, 1928, it was stated that the Mediterranean Fruit Fly (*Ceratitis capitata*) attacked citrus in Java. Advice has now been received from Java that the Mediterranean Fruit Fly does not occur in that country, the species being responsible for attacks on citrus being *Dacus ferrugineus,* which is controlled by poison bait sprays. Apparently this regrettable error arose through a misunderstanding in discussing fruit fly infestation in Java.

QUEENSLAND SHOW DATES.

AUGUST.

Peak Hill (N.S.W.), 5-6.
National Association, 11-16.
Crow's Nest, 27-28.
Wynnum, 29-30.

SEPTEMBER.

Parkes (N.S.W.), 2-3.
Imbil, 3-4.
Malanda, 5-6.
Bogan Gate (N.S.W.), 10.
Gympie, 10-11.
Redcliffe, 12-13.
Beenleigh, 19-20.
Rocklea, 27.
Esk Campdraft, 26-27.
Kenilworth, 27.

OCTOBER.

Southport, 3-4.
Enoggera, 4.
Nerang, 10.

NEW ZEALAND FARMERS IN QUEENSLAND.

The idea of mutual visits of farmers to New Zealand and Australia has developed greatly in recent years, and the tour lately of a party of New Zealand producers through the south-eastern corner of this State suggested even greater expansion of that idea in the future.

The need of the farmers of the Commonwealth and Dominion is to meet one another more, and to get to know something of each other's problems and successes, as well as to realise that they are not so much competitors as fellow-workers.

Personal contact and social interchanges mean, too, the removal of many misunderstandings and misconceptions and altogether a better appreciation of the fact that if we work together we can increase the prosperity of each Dominion, and at the same time add to the wealth and security of the British Empire as a whole.—EDITOR.

WARWICK was the first halt in the recent tour of a comparatively small section of Southern Queensland by a party of New Zealand farmers, who had come to see for themselves something of the Commonwealth and its country life. With all its orchards bare of leaf under a grey winter sky, the fruitful Granite Belt was not looking its best when the visitors passed through. Sufficient was seen, however, to suggest a sure, though strenuously acquired, prosperity in Queensland's apple uplands. When they reached the gateway of the Darling Downs, that vast territory said by Sir John Russell, of Rothamsted, to be one of the most fertile tracts of black-soil lands in the world, they saw something of the country on which Queensland's title as the most richly endowed State of the Commonwealth is based.

A Queensland welcome awaited the visitors at Warwick. Recent rains had caused a curtailment of the tourists' programme, and road travel was limited to the environs of the wheat land centre. From points of vantage, miles and miles of farming lands divided into wide valleys by lightly wooded uplands and rimmed by mist-wrapped mountain ranges were spread before the visitors' view. It was a winter landscape, nowhere to be matched within the Commonwealth—a countryside green with growing crops giving promise of a bountiful harvest, and dotted with homesteads on the banks of willow-shaded streams.

Mr. Colin McIntosh, leader of the Delegation, speaking on behalf of his fellow farmers, said that Warwick and its beautiful surroundings had greatly impressed them. Their party consisted of active farmers, and the object was not only sight-seeing, but education by an exchange of ideas with Queensland farmers. They were here to find out our difficulties, and to try to work together in solving ours and their own problems.

"We compete with each other in various markets," said Mr. McIntosh, "but there is plenty of room for us all." It was a fact that a lot of New Zealand land carried a cow to the acre, and five to seven sheep. The secret was not so much good soil, but principally climate, regular rainfall, use of fertiliser, and humidity, which gave abnormal growth. He was astounded at Australia's low land values, wheat land here being about half the cost of that in New Zealand.

Visit to the Netherby Stud.

A visit was made to Mr. J. T. Scrymgeour's Netherby stud, on the Condamine River, close to Warwick. This stud was formed by Mr. Scrymgeour in 1922 with a nucleus of about half-a-dozen cows of pure Scotch blood. Netherby is a small compact freehold property of 305 acres of heavy arable black-soil land, fronting the Condamine River, and extending on to a lighter red-soil ridge, where the homestead stands. "Milton's Grandmaster" and "Heatherwick's Standard-bearer," together with about twenty-five head of aristocratically bred cows and ten choice heifers, form the herd. Practically all the females are from imported blood in the immediate crosses. A small but select stud of thoroughbred horses is also maintained on the property.

Mr. Scrymgeour is an outstanding figure amongst cattlemen of the Commonwealth. Though he is totally blind, as the result of a gunshot wound in the head

received while a member of the 2nd Light Horse Regiment during the great war, he is a very keen judge of cattle, possessing a wonderfully developed sense of touch, and is able to fault an animal where another, possessed of his full powers of sight, would overlook slight blemishes. He personally supervises and takes an active part in the working of the farm. Mr. Scrymgeour has few equals in his knowledge of Shorthorn pedigrees, and is a keen follower of the turf, particularly at Brisbane. With the aid of a wireless set he is fully informed of the winners each race day, and through the daily newspapers, which are read to him, he is kept well acquainted with the doings of the outer world. From the homestead at Netherby to the paddocks and cattle stalls an ingenious arrangement is installed for the guidance of Mr. Scrymgeour. It consists of overhead wires, running from the homestead to the various paddocks and stalls. A hollow metal cylinder is drawn across the wires by means of a length of rope, one end of which is attached to the cylinder, and the other end left hanging loose so that it may be grasped by the hand, and so guide a person when walking along. The business of the farm is conducted by him, and he types his own correspondence. Mrs. Scrymgeour, who is a very capable stock judge and a noted horsewoman, is his remarkably keen lieutenant.

At Toowoomba.

The rest of the day was enjoyed in a journey across the Downs to Toowoomba. The Mayor of Toowoomba and representatives of the Chamber of Commerce and primary industries travelled to Warwick to meet the tourists, and on the way back pointed out places of interest, and provided useful information pertaining to the district's primary products.

"I am greatly surprised at the extensive areas of wheat grown on the Downs and the absence of grassed areas," said Mr. Colin McIntosh, in the course of an interview with a press representative. He said it was the custom in New Zealand for farmers to plant, say, two crops of wheat, and then sow grass in order to give the land a rest. He was greatly impressed with the samples of Queensland wheat exhibited on the train, and was of the opinion that they would meet with great favour in New Zealand, as they were hard varieties,

For the first time in their lives the majority of the visitors viewed the Illawarra breed of cattle. Mr. McIntosh stated that it appeared to be quite a first-class dual purpose animal, and the Australian equivalent to the New Zealand milking Shorthorn. They were both suited to their own particular countries, and he did not think that any good purpose would be served by attempts to introduce the Illawarra into New Zealand.

Toowoomba Butter Factory.

Mr. C. Lynch, a member of the party interested in dairying, expressed delight at the up-to-date butter factory inspected at Toowoomba. It was beautifully clean and excellently managed, but he did not think that there was anything here to surpass the efficient machinery installed in New Zealand factories.

At Gatton.

The New Zealanders regarded their visit to the Queensland Agricultural High School and College on their way down from Toowoomba as one of their most interesting experiences since their arrival in this country. According to their leader, Mr. McIntosh, the visitors were greatly impressed with the useful and progressive work being performed there. Personally, he rather liked the idea of taking boys direct from the primary schools and allowing them to get their secondary education at the college. In New Zealand they found that boys who were sent to the city schools to complete their studies were loath to return to the land. They lost in some degree the agricultural bias essential to their livelihood.

AT SWIFT'S MEATWORKS

Among the many inspections made by the party of New Zealand farmers while visiting the eastern coast of Australia was that of the meatworks of Swift Australian Company Limited, Brisbane. The visitors were warmly welcomed by the Swift organisation, which spared no pains in explaining their entire system of operations, from the slaughtering of the various classes of live stock to the final preparation of the many edible and inedible products obtained.

At the termination of the inspection a hearty vote of thanks was accorded the members of the staff, and in response Mr. E. F. Sunners, manager of the company, stated that it was a great pleasure for the officials of the company to meet the visiting farmers, particularly when they evinced such a keen interest in the manner

in which the products of the land were handled through the secondary stage of production. That, of course, was a very important stage, and, wherever their plants were located, it was the policy of the Swift people to encourage a closer understanding between the producers of the raw material and themselves as manufacturers and distributors of the finished products. As they were probably all aware, the Swift distribution of meat and allied products is conducted on an international basis, and the Swift brand, and the high standard it stands for, is known world-wide. It would probably interest them to know that when the company began operations in Queensland, some sixteen years ago, it invested more than £1,000,000 in building modern works, and since then has purchased live stock to the value of about £15,000,000, and paid away in wages and supplies some £6,000,000. "We have at our disposal in the importing countries of the world a highly organised selling organisation, which can take good care of the products shipped to it from the various surplus producing countries where the company's slaughtering operations are conducted, and you, gentlemen," continued Mr. Sunners, "have seen for yourselves the efficient methods we employ in the preparation of our products and towards the elimination of waste."

Profits from Savings.

They recognised the principle that profits largely came by way of savings, and that low costs, together with high-quality goods and services, were the answer to practically all business problems. They were the means of getting the trade and holding it against all comers, and in the meat industry that condition could best be achieved through large-scale operations. They were perhaps aware, also, added Mr. Sunners, that there were important developments taking place which suggested that the future distribution of meat products would be by way of packaged goods, identifiable as to quality. So far as this country was concerned this method of distribution would possibly be in its best interests. To-day they shipped in the quarter or carcass and paid freight and charges on a good deal of bone and fat which had to be trimmed off before the meat was cut up for final distribution to the public. That material, if trimmed off at the works, could be put to valuable use in this country in the shape of animal foods and fertiliser, which would be badly needed in the production of the type of animals which the market now desires.

Market Requirements.

It was very important that producers should have full knowledge of the trend in market requirements, and that they should endeavour to accordingly change their production methods as might be necessary to meet that trend. It was a well-established fact that the present trend in meat consumption was very definitely towards meat from young, light-weight, well-finished animals. New Zealanders, particularly in regard to lamb, appear to be well informed in that direction, and they were practising those methods which enabled them to market the desired type, and that would enable them to continue doing so.

That was a safe position to be in, for this was an age when the consumer demand must be studied if the products of the land were to freely enter into the channels of trade, and quality counted to-day in all classes of products. This situation necessarily involved improved technique in all forms of primary production. In this State it would possibly involve a definite separation between the breeding and the finishing of live stock. They had an unlimited amount of suitable breeding country, but to-day they were lacking in the resources for fattening, which was the limiting factor to their production. In that direction, however, there were enormous possibilities for development within the reliable coastal regions, and he would say also that the future progress of primary production would depend more on the supply and proper use of fertiliser than on the supply and use of any other single resource, and live stock and larger acre yields were interlocking terms. The more the possibilities of that partnership were appreciated and developed, the more certainty would there be of producers earning profits, and the quicker would be the return to national prosperity.

AT BUNDABERG

Though Bundaberg was the most northerly point of their itinerary, the New Zealand farmers were able to form a favourable idea of the vitality of the Queensland sugar industry. At Nambour rain was pouring at the time of their stay. They saw something of the sugar as well as the fruit industry, but not enough to impress them with its importance. So it was not until they got to the

Bundaberg district that they were able to realise the vastness and value of sugar-growing in this State. It was unfortunate that they could not go further north where some mills had already commenced crushing. With that additional experience they would have been able to appreciate more the magnitude of the sugar industry and the general efficiency of its organisation. Notwithstanding excessively wet weather, they were able to follow the programme set out for them by the Bundaberg canegrowers, with the exception, unfortunately, of field operations. Mr. W. G. Gibson, of Bingera, had arranged cultural and other field demonstrations for their benefit, and which heavy rain prevented. The Sugar Experiment Station was missed for the same reason.

Fertile Cane Lands.

The New Zealanders expressed themselves astonished with the fertility of the cane lands around Bingera and in the Woongarra district, and commended strongly the evidences of sound farming practice on all sides. Their commendation was beyond the ordinary and polite conventions associated with such visits, for everyone of the party was a practical farmer bearing the marks of keen intelligence and hard toil. Earlier in their tour they had not hesitated to criticise cultural methods in other parts of the State, though often those criticisms were based obviously on an imperfect knowledge of Queensland conditions. The clean fields and green manuring crops flourishing alongside standing cane appealed to them particularly. When viewing the modern mill at Bingera with its massive machinery many of the visitors expressed amazement at the evidence of huge capital invested in the industry, while all were keenly interested in the milling processes as explained to them by members of the management, as well as the technical and engineering staffs.

A Heart to Heart Talk.

Local canegrowers were not slow in seizing the unusual opportunity of a heart to heart talk with farmers of the Dominion on some economical aspects of the industry. The visitors had already expressed their approval of the White Australia doctrine, and that formed the text of an appeal to them to consider the practicability of placing Queensland sugar on New Zealand dining tables. Though it was recognised that the Dominion requirements are supplied by Fiji, a British colony, it was suggested that when Fijian shipments fell short of New Zealand's needs, Queensland sugar should replace the Javan product.

In welcoming the visitors to Bingera, Mr. Gibson struck a strong note when he said that he hoped the day would not be far distant when New Zealand would be buying portion of Queensland's surplus yield instead of the black labour product from the islands. It would mean, if such an arrangement were made, that instead of having to export all the surplus over 13,000 miles, a big percentage would only have to cross the Tasman Sea. Queenslanders appreciated the fact that New Zealanders bought their sugar at a very much lower rate than the price ruling in this country. They import sugar from Fiji and occasionally from Java, and that sugar represented the produce of coloured labour. He urged a full measure of reciprocity between both Dominions. After emphasising the national aspect of the industry, and that concerned the Dominion as well as the Commonwealth, for the security of each was involved and the destiny of each must be commonly shared, Mr. Gibson added that as growers and millers they had established a high standard of efficiency, and applied science was making possible further developments.

Not a Spoonfed Industry.

The industry was not in any way spoonfed as had been suggested by certain interests in the South. In the Bingera area there were 410 suppliers, who, with their families, represented approximately 2,000 persons. In addition, Bingera employed 400 men. From those figures, applying to one Queensland mill, they could grasp the magnitude and importance of the industry. Mr. A. Bourke, their cane inspector, had covered 8,000 miles in the previous five months in the course of his work.

In the course of his reply on behalf of the New Zealanders Mr. C. McIntosh said that in the Bundaberg district they were seeing something entirely new to them. He, for one, was astounded at the quantity of machinery necessary for the production of sugar. On the White Australia policy he thought that was a matter on which the Commonwealth could be congratulated. The Federal authorities had taken the long view which would work out ultimately to the security of both Dominions. In New Zealand they had already a colour problem, for the fruit industry had passed into the control of Asiatics. He was especially impressed with

the fact that most of the machinery used in the Queensland sugar industry was manufactured in great foundries within the sugar belt; that showed that the industry was practically self-contained; it was also an example of the general progress which it made possible.

The value of these inter-dominion visits is strikingly obvious. Most of the New Zealanders were making their first journey away from the Dominion; they came with receptive minds and as shrewd observers they have gone away with a clearer idea of what the sugar industry means to Australia, and also, from the point of view of national security to New Zealand.

A Well Organised Tour.

The whole tour in Queensland was the last word in efficient organisation. Though the weather was excessively wet, especially on the near North Coast, there were no delays and no inconvenience. Mr. F. Pawson, representing the New Zealand Government, was the manager of the tour. The "Reso" train provided by the Queensland Railway Department was replete with every comfort. The Railway representative, Mr. A. E. Cole, proved himself an expert in modern transport. With the Railway Department was associated the Department of Agriculture and Stock, and two officers, Messrs. H. S. Hunter (Agricultural Branch) and J. F. F. Reid (Editor of Publications) accompanied the visitors throughout their tour.

The leader of the New Zealanders, Mr. Colin McIntosh, in the course of acknowledgments to the personal welcome his party had received from the Hon. Godfrey Morgan (Minister for Railways) and the Hon. Harry F. Walker (Minister for Agriculture), paid a tribute to the excellence of the arrangements made which enabled them to fulfil the purposes of an unforgettable visit to Queensland.

NERVOUS COWS AT MILKING TIME.

Milk secretion and milking is discussed by Mr. Stephen Bartlett, of the National Institute for Research in Dairying, in the Berkshire Milk-recording Society's Handbook. Some causes of variation in quantity and quality of milk are, he tells us:—

(1) Those causes which affect the speed at which milk is secreted or made in the udder between milking times.

(2) Those causes which tend to induce a cow to hold up a proportion of her milk at milking times.

Under the first heading it is known that secretion by many of the body glands is reduced by such things as insufficient food, ill-health or disease, fear, anger, and discomfort. Also there are other well-known factors which affect the speed of milk secretion, such as stage of lactation and age of the cow, as well as the point already mentioned, that secretion becomes slower as the quantity of milk in the udder increases.

Under the second heading one of the chief points to be noted is that the strippings of any cow are almost invariably rich in fat, sometimes being as rich as thin cream, so that retention of varying quantities of this rich milk will affect the quality of milk yielded by a cow more than it affects the quantity, and this can account for a considerable amount of the fluctuations which occur in the fat content of milk of cows from day to day.

It is possible that this holding up of portions of milk at milking time is associated with the differences in fat contents which occur between morning and evening's milk when unequal night's and day intervals occur, but since conclusive evidence cannot be offered, it is not desirable to emphasise the point. Since accumulated milk in the udder checks the rate of secretion, it will be obvious that milk retained at one milking will retard the rate of secretion before the next milking, and the effect of inefficient milking is to create a type of vicious circle which reduces milk yield.

If cows are always treated in such a manner that they never suffer any unnecessary discomfort nor have any reason to sense danger from their masters there is less chance of milk being held up at milking time. It is only reasonable to expect some cows to possess more uneven temperaments than others, and so one cow may be affected by a disturbance which another fails to notice. It has been found that milk secretion is not controlled by the nerves, for a cow can secrete milk when the nerves of the udder do not function, at the same time there is no doubt that during the actual milking process nervous control plays an important part, and unless a cow experiences a pleasurable sensation, free from fright, during milking time, it is unlikely that all the milk will be drawn.

QUEENSLAND BUTTER.

By CHAS. McGRATH, Supervisor of Dairying.

Subjoined is the text of an address delivered by Mr. McGrath at the Annual Conference of the Queensland Butter and Cheese Factory Managers and Secretaries' Association at Brisbane in June last. In the course of his address Mr. McGrath reviewed the position and the conditions of dairying in Queensland. He reminded his hearers that the pastoral, agricultural, and dairying industries represent the greatest actual and potential purchasing power in the Commonwealth. Through their efficient operation, they represent, too, the source of a strengthening current of finance that is vitalising the various groups of manufacturing and commercial activities.

FROM a perusal of the figures available it is learnt that the quality of butter produced for the year ending 30th June, 1930, will exceed that of the previous year, which was the peak year by some £2,000,000; the production of cheese will approximate that of last year, while the total value of the dairy products of the State for the year will be approximately £7,000,000 sterling.

The dairy herds of the State form the medium through which we recover this large amount of wealth by converting pasturage and fodder crops into milk. By such transmission the soil is not impoverished, but, on the contrary, by modern dairy methods it is left in a condition every year to continue to maintain or increase its productivity.

In this State and throughout the Commonwealth the return from grazing, dairying, and agricultural activities is the basis of our national wealth, and our future prosperity is directly associated with the conservation and improvement of our native pasturage, the maintenance of the soil fertility, the conservation of fodder, and the breeding of high class live stock.

The dairy industry is varied in its activities which include the milk supplies to cities and towns, the manufacture of butter, cheese, condensed milk, ice cream, and a variety of products obtained from casein.

There is evidence that in the near future the primary producers will give the matter of the city and town milk requirements more attention.

Food Value of Milk and Its Products.

As the comparative food values of milk and milk products become more widely known, these products will enter more largely into the daily dietary of the people than they do at present. The consumption of milk and butter is on the increase, but owing to the facilities offered residents of suburbs of cities and towns to keep a house cow, definite figures relative to the actual quantities of milk and butter produced from such sources are difficult to obtain. There are some hundreds of good type Jerseys, Australian Illawarra Shorthorns, and Ayrshires kept for household purposes by men engaged in activities other than dairying in cities and towns throughout the State.

The citizens of the State and Commonwealth are connoisseurs of dairy products, and only first grade dairy products are marketed in our own home markets.

The output of all the butter factories in this State is the product of pasteurised cream, and our choice butters have reached a high standard of quality.

As in dress so in dietary, the public taste undergoes a change as time wears on and the vast majority of the consumers now appreciate a sweet, mild, clean-flavoured appetising butter. The factory managements have responded to the demand and the market requirements are fully met by the output of the choice grade butter of factories throughout the State.

Oversea Market Requirements.

I availed myself of the opportunity of spending a forenoon on the grading floors with Mr. Pollard, a representative of the firm of H. Dean and Co., the well known firm of dairy produce merchants of London. From his selections of butter

it was evident that the market of the United Kingdom favours a sweet, clean, mild-flavoured butter possessing the characteristics of the butters that are placed in the premier position at the annual competition in Brisbane.

Butter possessing the desired characteristics is the product of clean, full-flavoured nearly-sweet cream, for from experience I know that the premier butter on the benches in this year's competition is the product of carefully selected cream possessing the characteristics mentioned, and have been made by skilled butter makers who have gained further honours for their companies and incidentally for the State.

The delivery of a high grade nearly-sweet cream is of vital importance to the industry and is dependent upon its production under hygenic conditions, with frequent deliveries to the factory.

Cream Transport.

The importance of organisation of transport from farm to factory will assist in improving the quality of the cream and make for increased efficiency in the conduct of factory operations.

Any dispute regarding the territorial rights of supply to factories should not be allowed to block the way to organisation of transport. Where disputes exist regarding the territory from which dairy factories should solicit supplies, the matter should be referred for settlement to a committee of three disinterested persons nominated by the chairman of directors of the dairy companies operating in the division of the State where the dispute exists.

Interstate Boundaries.

Through the activities of the State Boards associated with the industry, the interstate boundaries have been effaced as far as they pertain to the operations of the dairying industry, and the good will which now exists among dairymen throughout the Commonwealth ensures an improvement not only in their material, but also in their social welfare. The time for settlement of minor inter-factory differences or misunderstandings is overdue.

Quality of Butter.

Co-operation with the officers of the Commonwealth Grading Division enables State officers to examine and grade all the dairy produce submitted for export; and, in conjunction with the examination and grading of dairy products intended for interstate and local markets, affords the State officers an opportunity of forming a comprehensive and reliable opinion on the quality of the dairy products manufactured in the State. The system allows of a comparison being made of the quality from year to year, and of the influence of seasonal conditions on the products of the industry.

From a review of the reports by the Chief Grading Officer for Queensland, Mr. G. H. Heers, it is learnt that a general improvement has taken place in the quality of the butter and there is a greater degree of uniformity.

Manufacturing faults are infrequent, and this is due to the fact that the great majority of factories have installed modern efficient manufacturing plants. Generally the body, texture, and condition of the butter marketed is evidence of the efficiency of the men who are responsible for its manufacture.

During the summer, floods that occurred in sections of the dairying districts prevented regular deliveries of the cream, and this accounted largely for the quantity of inferior butter manufactured.

While there has been a general improvement in the quality of the butter produced during the year, I wish to stress the necessity of increased effort on the part of all associated with the industry, with a view of maintaining a high standard of quality and of using every endeavour to eliminate the production of low grade products.

A review of the work of the butter graders during the year indicates that the cream graders at some of the factories are passing into choice and first grades a proportion of cream that is not up to the standard quality of the cream with which it is pooled. "Border" cream" is a term applied in cream grading to

a product of doubtful character. The term implies that on a quality determination it is in the line of division between two grades, and the tendency is to class it with the higher of the grades.

A trained and experienced grader, by the exercise of care on the grading floor, and by keeping in touch with the results of his work as disclosed by an examination and grading of the butter produced from the graded cream, will be enabled to classify the cream according to its quality and do justice to all producers.

The cream grader is entrusted with most important duties, and on their proper performance depends to a very great extent the welfare of the factory and the producers associated with it. If cream be put into a pool with a product of a higher grade, the supplier of the higher grade product is deprived of a portion of the return to which he is entitled. By careful grading a premium is paid for quality, and it is only by paying a premium for high quality can we expect to obtain quality.

The quality of the butter is influenced to a great extent by the care and attention given to its production and handling on the farm, and the reputation of a factory's management and staff suffers in proportion to any inefficiency which may exist in the grading and manufacturing departments.

Modernly equipped dairy factories make provision for the handling and processing of the cream so as to ensure that the butter produced will be of the highest quality that can be obtained from the cream treated.

Pasteurisation.

Attention to detail and efficiency in carrying out the processing of the cream are essential in order to obtain the benefits of pasteurisation. The flash system is installed in practically all the factories of the State. The batch system serves a few factories of small output.

The importance of subjecting all portions of the cream to effective temperatures cannot be too strongly stressed, and provision should be made so that when desired the cream leaving the pasteuriser can be returned to the bulk cream tank and enable the processor to carry out his work efficiently. Should a portion of the cream pass from the pasteuriser to the cooler without being subjected to the required temperature, it would recontaminate the bulk cream in the holding vat. Other sources of recontamination of the pasteurised cream are unclean cream coolers, pipes, holding vats, churns, packers, and contaminated wash water. Provision should be made to facilitate the cleansing and sterilising of all portions of the plant and utensils with which the cream and butter comes in contact.

Surface Taint in Butter.

Realising the necessity of eliminating a surface defect in butter, which may be confused with a flavour taken up by the surface of butter which is in proximity to unseasoned timber, a committee consisting of Messrs. C. F. McGrath (Supervisor of Dairying), G. H. Heers (Senior Grader), J. C. Brünnich (Agricultural Chemist), E. C. Tommerup, B.Sc., C. J. J. Watson (Forestry Department), C. J. Pound (Government Bacteriologist), F. W. Uhlmann (General Manager, Caboolture Co-operative Dairy Association), and D. Saxelby (General Manager, Queensland Farmers' Co-operative Dairy Association), representatives of the Factory Managers' Association was appointed by the Minister for Agriculture, Mr. H. F. Walker, to ascertain the cause of the defect and suggest remedies for its elimination.

Exhaustive experiments were carried out with varieties of timber used in the construction of butter boxes within the Commonwealth. Two members of the committee, Messrs. Heers and Uhlmann, visited New South Wales and Victoria to ascertain if the defect were peculiar to the butter manufactured in this State. It was found that a defect of a similar character was existent in the product in both the Southern States. In carrying out their investigations, the co-operation of the State and Federal officers was readily forthcoming.

In testing the suitability of various timbers as butter containers, exhaustive tests were made and will be fully dealt with in a report to be furnished by the committee when further investigations which are now proceeding are completed. Results of the experiments, relative to the influence of the timber used in the construction of butter boxes on the incidence of the defect, justifies the committee in arriving at the conclusion that Queensland Hoop Pine and Kauri Pine are second to no other timber used in the experiments.

The following timbers were used experimentally:—Queensland Hoop Pine and Kauri Pine, New Zealand White Pine, Grey Satinash, and Silver Quandong.

Moisture Content in Butter.

The standardisation of the moisture content of the butter does not receive in a few cases the attention that its importance warrants, for several brands of butter vary considerably in moisture content. Determinations of the moisture should be made at intervals during the working of the butter and so ensure a content of approximately 15.75 per cent.

Deodorisation of Cream.

A decided improvement in the quality of butter was noticeable from those factories which had installed cream deodorisers. The process is found beneficial in removing volatile and volatilable feed odours and flavours and, by increasing efficiency of the process of pasteurisation, adds to the keeping properties of butter. It will not convert an old, stale, fermented cream into a first grade substance. The expense of so processing such low grade cream is not covered by any improvement in the quality of the product.

Improvement of Factory Buildings and Equipment.

At no previous period in the history of the dairying industry has the matter of improvement of dairy factory buildings and equipment received the amount of attention that has been given during the period under review.

Large factories constructed of concrete or brick and supplied with the most modern dairy factory equipment have been completed or are under construction in dairy centres in Southern and Central Queensland.

The opening of a modern butter factory at Toowoomba in May last was associated with conferences of the several Boards functioning under the provisions of the Primary Producers' Organisation and Marketing Acts. Official representatives of the industry from all the States of the Commonwealth attended to confer on matters of vital importance to all associated with the industry throughout Australia. Facilities were afforded the visitors to see a large area of the Downs, and one and all were greatly impressed with the fertility of the expansive Darling Downs Tableland. In their association with the opening of the Downs Co-operative Butter Factory at Toowoomba they voiced their admiration of the optimism of the directors of the company in establishing a large modern factory, and leaders of the industry from other States who recently toured the dairy centres overseas pronounced the new factory and equipment to be second to none in the dairy world. A large modern butter factory is nearing completion for the Port Curtis Co-operative Dairy Association at Gladstone, which on completion will be worthy of similar commendation.

The holding of the conference of the members of the Executive of Boards associated with the industry in centres of dairying activities is commended, for by so doing information is obtained that assists them in carrying out their important duties.

The Future.

It is significant that organised dairy farming is now recognised on the part of the Government and by commercial and industrial groups as a vital economic factor in the progress and prosperity of the Commonwealth. I say, advisedly, dairy farming conditions as they existed prior to the closer organisation of the industry were such as to deter the settlement of the rich agricultural areas of this State, which are now dotted with the homesteads of progressive agriculturists and dairy farmers.

Grazing, agriculture, and dairy farming represent the greatest potential purchasing power of the Commonwealth. The financial returns from such sources are made available for the further development of rural areas, and the improvement, construction, and equipment of manufacturing units, thereby creating a strengthening current of finance to vitalise the various groups of manufacturing and commercial activities.

The outstanding factor that inspires confidence in the future is the strength of the co-operative control ensuring recognition of a policy in the best interests of the industry, efficiently carried out by the various controlling boards.

Agricultural and dairying activities differ from some other groups in that the returns therefrom are largely invested in the products of various industrial activities which by increasing the volume of employment and thereby stimulating trade adds, to the prosperity of the people as a whole.

PINEAPPLE CULTURE.

NOTES ON MANURIAL EXPERIMENTS.

The Director of Fruit Culture, Mr. George Williams, has supplied the following notes of some manurial trials carried out on the Pineapple Experimental Plot at Elimbah.

Area: Half acre. Soil: Light loam—grey to light brown. Treatment: Quarter area subsoiled with gelignite. Air slaked lime applied to ¼ acre, pulverised lime on ¼ acre in October, 1928.

Maize was planted for a green crop and ploughed under in February, 1929. The final ploughing prior to planting was from 9 in. to 12 in. deep. The plots were planted with gill sprouts at the end of March, 1929. Paper mulch was used in three rows. Fertilisers were applied to fourteen rows; two were untreated.

Inspection twelve months after planting shows a distinct advantage in favour of potash; in fact; the most promising row had been treated with potash sulphate only. Phosphates including bone dust showed no appreciable results. Dried blood improved the colour of the foliage and to some extent stimulated growth. When associated with potash the colour of the foliage was improved without appreciable increase in growth above that where potash alone was used. To the soil occupied by two rows, calcium cyanide was applied before planting with the object of destroying nematodes if present. The plants showed no benefit.

Three rows planted through paper mulch do not in this particular class of soil show any resultant benefit. The experiment is being continued, further applications of fertiliser having recently been made. It was noted before planting that a portion of the plot required draining, and this is now more reflected in the plant growth. Necessary drainage is now being considered and this practice will, it is expected, result in a marked improvement on next season's growth.

Detailed information is shown in the following table:—

Plot: Fourteen Double Rows—9 ft. (Centre to Centre) apart, 50 yards in Length.

Row Number.	Nauru Phosphate.	Sulphate Potash.	Dried Blood.	Bone Dust.	——
	Lb.	Lb.	Lb.	Lb.	
1 ..	..	..	..	..	Check; poor growth.
2 ..	24	..	..	..	Soil treated with calcium cyanide; no improvement.
3 ..	24	..	..	..	Paper mulched; poor growth; pale foliage.
4 ..	..	..	20	..	Growth improved; of good colour.
5 ..	..	16	20	..	Growth fair; even; rather pale.
6 ..	..	..	..	40	Paper mulched; poor; pale growth.
7 ..	..	20	..	..	Good growth; fair colour; best row.
8 ..	18	..	18	..	Medium growth; good colour.
9 ..	16	18	14	..	Paper mulched; variable; fair to good.
10 ..	20	24	18	..	Fair growth and colour.
11 ..	..	24	18	40	Fair growth and colour.
12 ..	14	20	16	..	Paper mulched; soil treated with calcium cyanide; poor growth.
13 ..	12	..	..	30	Poor weak growth.
14 ..	..	..	..	..	Check: poor condition.

Rows 1 to 9 soil trenched with explosive.

Plate 51.—Row No. 3. Pines Planted through Paper Mulch.

Plate 52.—A Field in Need of Drainage.

Plate 53.—Row No. 7. Row Treated with Potash (20 lb.) only.

Plate 54.—General View of Plot.

WINTER SCHOOL FOR PIG FARMERS.

By E. J. SHELTON, H.D.A., Senior Instructor in Pig Raising.

Covering a fortnight's residence at the Queensland Agricultural College, at Gatton, and including both practical and theoretical training, the third of a series of schools of instruction for farmers, and their sons, interested in the breeding, feeding, and management of pigs, concluded early last month. Though the attendance was smaller at this than at former schools, the reduced number in no way indicated lack of interest, but was entirely due to abnormal weather conditions, heavy rain and, in some districts, floods a few days before the school opened, necessitating cancellation of arrangements by other farmers who had intended being present.

This year's school was marked by even keener interest and application, and the students as a body reported that they had thoroughly enjoyed and much appreciated the opportunity provided of attending such an important course of training. Mr. W. Koehler, of Yamsion, Dalby, who was elected president of the school committee, said that the school would have a vast influence in creating greater interest, leading to considerable improvement in the type of pigs bred and marketed in Queensland. His own experience in attending the lectures and practical demonstrations was that he had been enabled in the two weeks at the College to learn much more about pig farming than he had thought possible in such a comparatively short course. Professor J. K. Murray, B.A., N.D.D., Principal of the College and Professor of the Chair of Agriculture at the Queensland University, addressed the students on several occasions and gave a most interesting series of talks on "Bacteriology and the use of the Microscope," and also on the "Principles of Feeding, Balancing of Rations." The value of these schools of intensive instruction is highly appraised by the Principal, and already several other important schools have been held including Tractor Schools, and Dairy Factory Employees' Schools.

Mr. A. J. Mackenzie, Lecturer in Animal Husbandry, was present throughout and gave a number of valuable lectures on Diseases of the Pig, on Improvement of Breeds, and on Anatomy, Physiology, and other phases of animal husbandry.

Mr. E. J. Shelton, H.D.A., Senior Instructor in Pig Raising, and Mr. L. A. Downey, H.D.A., Instructor in Pig Raising, were also present and dealt both in lectures and practical demonstrations with the subjects of Breeds of Pigs, Housing and Accommodation, Design and Construction of Piggeries, the Selection and Judging of Breeding Stock. These lectures were also illustrated by lantern slides. The evening sessions were also attended by the regular College students.

Mr. J. F. F. Reid, Editor of Publications, Department of Agriculture and Stock, discussed, in an informative way, ways and means of "Putting More Money into the Farmer's Pocket." The students would have liked Mr. Reid to have enlarged on this subject and on economics generally, but time did not permit. The "Parasites of Livestock" were discussed and illustrated by Mr. F. H. S. Roberts, M.Sc., recently appointed Veterinary Parasitologist in the Agricultural Department; while Mr. C. T. White, Government Botanist, dealt very fully, in a practical demonstration, with the question of Poisonous Plants and Weeds. To indicate ways and means of keeping piggeries in a more hygienic condition and in a manner that will be satisfactory to Departmental Inspectors, Mr. H. G. Cheeseman, Senior Slaughtering Inspector, attended and spent a very useful hour with the class. Mr. C. J. Pound, Government Bacteriologist, dealt very fully, both in a practical talk and in an illustrated lecture, with Tuberculosis in Pigs and Other Stock, and with the use of Disinfectants. These lectures are always of interest and value, and have an important bearing on the management of farm stock.

By means of a cinematograph film and in an informative talk, Mr. R. G. Watson, Chairman of the Queensland Pig Industry Committee, and Secretary of the Queensland Bacon Curers' Association, dealt with Commercial Pig Farming, and indicated the procedure on his own pig farms at Kingston and Beaudesert, where more than 800 pigs are kept and fed on buttermilk and farm-grown foods, with commercial foods purchased from outside sources. Mr Watson, in his capacity as President of the Australian Stud Pig Breeders' Society, also briefly reviewed the activities of that body and of the Queensland Branch which now has more than 100 members.

Mr. A. G. Aitchison discussed the Home Project Schemes in which the Departments of Agriculture and Stock and of Public Instruction are co-operatively interested, and illustrated boys and girls at work in country Pig and Calf Clubs, Poultry Clubs, and other activities of special interest to the junior farmer.

Mr. Woodward, of the College staff, dealt with Farm Bookkeeping, and Mr. Graham with Fodder Crops, Soils, and Agricultural Machinery. Mr. Bosworth, of the staff, also discussed Agricultural Education and the Growth of Co-operative Societies. The practical demonstrations included lessons on castration, killing and dressing porkers, and post mortem work generally. Some time was spent in inspection of the stock, and discussion on the Pig Breeding Experiments at the College

Plate 55.

Members of the School of Instruction for Pig Farmers at Gatton College, Queensland, July, 1930.

Piggery, where between 500 and 600 pigs are kept. For the information of all concerned Mr. J. P. Bottomley, Treasurer, and Mr. H. W. Watson, Secretary of the Royal National Agricultural Association, Brisbane, reviewed the activities of that organisation and discussed the Pig Section Classes at the Brisbane Exhibition, Queensland's great livestock show.

In the course of the sessions of the school, the members of the Queensland Pig Industry Committee attended to hold their monthly meeting, and inspect the stock in the Pig Breeding Experiments in which they also are interested. On this occasion opportunity was taken by the members to discuss with the school questions relating to the marketing of pigs and to the urgency of increasing local consumption of Queensland pork products.

An hour was spent each evening in asking and answering questions and in general discussion of various topics, while the weekly picture show and a breaking-up social concluded a very interesting course of instruction to which a much larger attendance is expected next year.

Those attending the course included:—L. Caulley, Sexton, via Miva; D. J. Gillespie, Wynnum South; H. Fox, Cushnie, Tingoora; J. S. Wengert, Cushnie, Tingoora; W. Koehler, Yamsion Stud Piggery, Yamsion; S. G. Knight, Ballgamon, Nanango; Len Storey, Kingsthorpe; H. Mansbridge, Greenmount; J. S. Porter, "Gallangowan," Nanango; H. B. Taylor, Monal Creek; P. Kajewski, Glencoe, Gowrie Junction; M. J. Brosnan, Headington Hill, Clifton; A. Kerle, Rosevale, Kalbar; and F. Wright, Rosewood.

In addition, three special course college students and three University students attended certain of the lectures and demonstrations and were present on the occasion of the visit to the bacon factories.

IMPORTED PEDIGREE SOWS.

There arrived during the week ending 6th July, 1930, from New Zealand, two Large White sows from the stud of Mr. C. S. Mexted, Te Kawa. One sow is for Mr. R. G. Watson, of the Kingston Pig Farm Company, and the other is for Mr. J. A. Heading, of Murgon. These two sows are full sisters. One sow took first prize at the Hamilton and Otorohanga Shows and the second at Auckland, while the other won second prize at the first two shows and first prize at Auckland. They are by Tamaki Canadian Sargeant (the North Island Champion boar) from the famous sow College Y 745 (imported from Canada). This sow won with outstanding honours in Canada and since going to New Zealand has been shown three times, gaining three firsts and two championships. The sows imported to Queensland are in pig to Tamaki Major. This importation introduces to Queensland some of the best blood of the Large White breed obtainable in the Southern Hemisphere and, as the breed has been recommended by all countries that have conducted inquiries into the pig industry, these sows, together with introductions by the same stud masters from Victoria, should be a decided acquisition to the stud pig industry of Queensland.

IN FAVOUR OF THE LARGE WHITE PIG.

Writing in support of the Large White pig (also called the Large Yorkshire and the Large White Yorkshire), a prominent Southern breeder states this breed has made rapid headway in Victoria.

Seven years ago there were only two studs of the breed in that State, whereas to-day many of the leading breeders are turning their eyes towards this famous old British breed, and there are numerous very high-class studs from which suitable stock could be secured. By many they are considered the best bacon-producing pigs in the State, and not only the best but the most economical producers of high-quality bacon. They are very early-maturing, and are ideal as baconers on account of their long, deep sides which do not carry too much fat, as many other types do, and which on that account in other countries are often referred to as "lard" breeds. The texture of the Large White bacon is fine and, being early-maturing, it is more succulent and palatable than the slower-maturing types, and also more suitable for Australian requirements. The Large Whites are splendid pigs for crossing purposes, and in that respect have been the means of greatly improving many common herds of pigs from a bacon-curer's standpoint. They are readily sought, and invariably bring the highest prices at pig sales. Baconers have been sold for the farm of the breeder referred to at the age of eighteen weeks, whereas twenty-two weeks had been the best for any other type weighing 130-140 lb. These records have often been exceeded overseas, where also the breed is extremely popular.

CLIMATOLOGICAL TABLE—JUNE, 1930.

Supplied by the Commonwealth of Australia Meteorological Bureau, Brisbane.

Districts and Stations.	Atmospheric Pressure. Mean at 9 a.m.	Shade Temperature.						Rainfall.	
		Means.		Extremes.				Total.	Wet Days.
		Max.	Min.	Max.	Date.	Min.	Date.		
Coastal.	In.	Deg.	Deg.	Deg.		Deg.		Points.	
Cooktown	29·99	79	64	85	1	54	29	340	3
Herberton	..	70	50	76	16	34	20,21	57	5
Rockhampton	30·07	71	55	77	7	45	5	1,047	13
Brisbane	30·13	68	54	74	1	41	9	758	16
Darling Downs.									
Dalby	30·15	64	47	72	22	28	9	236	10
Stanthorpe	..	57	43	65	20	19	9	470	19
Toowoomba	..	58	46	65	21	31	9,30	831	17
Mid-interior.									
Georgetown	29·99	80	51	86	9	36	18	5	1
Longreach	30·10	70	48	79	29	41	17	15	3
Mitchell	30·15	62	44	70	23	28	10	184	14
Western.									
Burketown	30·03	80	56	85	10,27	49	18,19	0	0
Boulia	30·11	74	46	80	26,28	38	21	0	0
Thargomindah	30·16	63	47	71	26,27	37	9	30	3

RAINFALL IN THE AGRICULTURAL DISTRICTS.

Table showing the Average Rainfall for the Month of June, in the Agricultural Districts, together with Total Rainfall during June, 1930 and 1929, for Comparison.

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	June.	No. of Years' Records.	June, 1930.	June, 1929.
North Coast.	In.		In.	In.
Atherton	1·61	29	1·14	1·29
Cairns	2·78	48	3·40	2 60
Cardwell	2·04	58	0·70	1·46
Cooktown	2·00	54	4·00	2·02
Herberton	1·04	43	0·57	0·87
Ingham	2·34	38	2·92	1·60
Innisfail	7·04	49	11·26	4·69
Mossman	2·03	17	2·29	1·76
Townsville	1·32	59	1·37	2·03
Central Coast.				
Ayr	1·45	43	1·71	3·24
Bowen	1·61	59	3·28	1·81
Charters Towers ..	1·30	48	1·86	1·76
Mackay	2·68	59	3·07	2·41
Proserpine	3·37	27	6·57	2·49
St. Lawrence.. ..	2·49	59	7·77	6·87
South Coast.				
Biggenden	2·17	31	7·01	1·97
Bundaberg	2·84	47	8·76	3·36
Brisbane	2·85	79	7·58	4·40
Caboolture	2·66	43	12·37	3·45
Childers	2·48	35	8·70	1·38
Crohamhurst ..	4·44	37	21·36	4·66
Esk ..	2·23	43	9·95	3·05
Gayndah	1·85	59	4·04	1·07
Gympie	2·67	60	10·69	2·63
Kilkivan	2·14	51	5·63	0·97
Maryborough ..	3·00	58	11·37	2·55

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	June.	No. of Years' Records.	June, 1930.	June, 1929.
South Coast—continued:	In.		In.	In.
Nambour	3·62	34	18·54	3·08
Nanango	2·06	48	5·07	1·38
Rockhampton ..	2·38	43	10·47	10·39
Woodford	2·87	43	14·56	3·52
Darling Downs.				
Dalby	1·70	60	2·36	1·15
Emu Vale	1·53	34	3·75	2·73
Jimbour	1·73	42	2·18	1·41
Miles	1·83	45	2·24	0·75
Stanthorpe	1·92	57	4·70	1·65
Toowoomba ..	2·42	58	8·31	1·38
Warwick	1·78	65	3·23	1·91
Maranoa.				
Roma	1·64	56	1·28	0·61
State Farms, &c.				
Bungeworgorai ..	1·48	16	1·34	0·43
Gatton College ..	1·87	31	5·93	1·47
Gindie	1·52	31	1·61	2·91
Hermitage	1·90	24	2·84	1·78
Kairi	1·46	16	0·86	1·42
Mackay Sugar Experiment Station ..	2·38	33	3·38	2 54
Warren	2·56	15	..	6·28

GEORGE G. BOND, Divisional Meteorologist.

CONTAGIOUS ABORTION.

By J. A. RUDD, L.V.Sc., Veterinary Surgeon, Department of Agriculture and Stock.

THE special treatment of dairy cows for abortion depends largely as to whether it is (i.) Contagious abortion (*a*) Curable, (*b*) Incurable; (ii.) Sporadic abortion; or (iii.) Troubles after calving.

(*a*) Contagious abortion may be curable if it is due to the bacillus coli, provided certain very definite steps are taken to prevent its spread, such as isolation of aborting cattle for at least three weeks and the flooding of the uterus with permanganate of potash, 20 grains to each gallon of sterile water.

If the placenta or cleanings are not voided, the following drench will assist in causing expulsion of the placenta:—

Epsom salts	12 oz.
Carbonate of ammonia	1 oz.
Powdered gentian	1 oz.
Powdered ginger	1 oz.
Treacle	1 lb.
Water	1 gal.

After the lapse of twenty-four hours, syringe out or flood the uterus by gravitation with the above solution if the placenta has been voided, if not repeat the drench. This is very seldom necessary.

(*b*) Contagious abortion due to the bacillus abortus is incurable and is very serious indeed. Adopt the foregoing treatment and, in addition, isolate the cow for six weeks after calving or after she has aborted, and dispose of the foetus and placenta by fire if possible. The discharge from the uterus is highly contagious and generally persists for about four weeks after calving.

The proper method is to differentiate from the first by means of a blood test, and if the test is positive the best plan is to spey the cow and fatten her for the butcher.

How Infection is Spread.

The method of infection is chiefly through the mouth, and the predilection seat is the uterus if the cow is in calf, and if not the mammary gland where it remains until the cow becomes pregnant and then it enters the uterus. Cow licking a cow which has aborted. The exudate from the septic uterus draining down the thighs and tail becomes spread about the body through the agency of the tail, and it may even reach the bodies of other cows in this way. The bull may also carry the organism and infect a cow during copulation, and when the cow aborts the bacillus gravitates to the mammary gland. The placenta and foetus is capable of infecting a cow after it has laid out in the paddock exposed to climatic changes for some months, even up to eighteen months as proven by experimental evidence.

The Blood Test.

The blood test for contagious abortion can be carried out at the Yeerongpilly Stock Experimental Station, where information as to drawing the blood for the test may be obtained.

Seriousness of the Disease.

Contagious abortion caused by infection with the bacillus abortus is very serious because it is directly responsible for—

(i.) Ninety per cent. of all the in contact or infected cows of a herd aborting.

(ii.) Thirty per cent. of sterility among the aborting cows of the same herd.

(iii.) Possibility of a large percentage of cows not holding to the bull at first service.

(iv.) Sterility among bulls in the affected herd.

(v.) Losses from white scour of 70 per cent. of calves born of recently infected parents which carry a relative immunity to the disease. Calves from these infected parents are frequently born with white scour.

(vi.) Septic pneumonia of calves born of infected parents which carry a relative immunity which is practically incurable.

(vii.) Infection from these calves is very liable to spread to healthy calves born of parents which are free of this disease.

(i.) The statement that 90 per cent. of the cows abort when a herd is infected with the Bacillus Abortus of Bange may probably be considered high, but it is fairly constant if the abortions which prevail in the herd during the first two years after the first cow is a proven aborter is taken into consideration.

(ii.) *Thirty per cent. sterility among aborting cows.*—It is during the first three years after the first cow has been proven a contagious aborter in a herd that this second trouble arises, but unfortunately it does not end there. Even with the greatest care in after treatment, which is more than the average farmer can possibly spare the necessary time to carry out, it gradually extends to the best producers in the herd, and this for no apparent reason. There will be found, too, some cows in the herd which have never been known to abort, but for some unknown cause they will not prove in calf.

(iii.) The possibility of a large percentage of cows not holding to the bull at first service, but coming back repeatedly even when a fresh bull has been introduced into the herd, is always present. This may easily prove disastrous in a pure herd, for all blood lines of a particular strain may thus easily be lost for ever and the ultimate objective of the breeder shattered almost to despair.

(iv.) *Sterility among stud bulls in the affected herd.*—It has been repeatedly stated that the bull is not a carrier, even if infected by the Bacillus Abortus of Bange. If such is true, how then is it possible to find nests of this same bacillus abortus in the epididimi of the testicles of infected bulls, which readily react to a blood test for the bacillus abortus, and how is it that such a bull can, if he is not badly infected at the time of mating, serve and stint clean cows which are not infected and which abort four months after being stinted, not having up to that time been in contact with any infected cattle? This is fairly clear proof that a bull can carry the bacillus abortus and spread the disease. Therefore, the wandering bull which is to be found in all the dairying districts of this State should not be tolerated. How often does a careful dairy farmer find his own bull secure in his bull paddock and his neighbour's bull following his herd into his yard, and perhaps his best stud cow in calf to a useless bull of doubtful pedigree?

(v.) *White scour among calves born full time of parents which have a relative immunity to contagious abortion.*—This is fairly constant among such calves, and I have known cases which were affected with white scour at the time of birth. This disease in these calves is not only hard to cure, but when they are cured they do not prove to be regular breeders when mature. At best they are only fitful breeders and are more often running in the paddock half fat than producing at the pail. When they are milking and come into oestrum and mated to a proven bull they do not come on again, but give the impression that they have been stinted and at the lapse of nine months, when they should be calving and coming into profit, they upset calculations by coming in to oestrum again being served and perhaps stinted for the second time in eighteen months. Others again come on regularly every twenty-one days as heifers, and never seem to hold to the bull and remain to be ultimately fattened for the butcher.

(vi.) Septic pneumonia of calves born of parents carrying a relative immunity to the contagious abortion bacillus is not very common, but once it makes a start it runs through a herd of calves, whether they are the offspring of contagious aborters or not. It makes a clean sweep, and unless vigorous measures are practised the whole crop of calves for that particular season is wiped out. Therefore, it is not advisable to purchase calves indiscriminately or introduce them into a healthy herd of calves from outside sources in case they carry infection into the herd.

Sterility among dairy cows which have never aborted and are not positive to the test for contagious abortion may be due to the abovementioned causes, although there is no known means of ascertaining the truth. But if it is possible to trace back their ancestry, it will be found that contagious abortion due to bacillus abortion is responsible for their sterility, either partially or wholly, as it affects them to a greater or lesser extent.

INTRODUCTION OF THE STUD BULL.

No fresh bull or cow should be introduced into a clean herd without going through the blood test for contagious abortion. It is possible to do this without the assistance of a qualified veterinary surgeon by getting into touch with the Yeerongpilly Stock Experimental Station, or either of the Commonwealth Government Laboratories at Rockhampton or Toowoomba at a very small cost. The intro- not advisable to purchase calves indiscriminately or introduce them into a healthy herd duction of a fresh bull should not be seriously considered without the test for tuberculosis, and the cost of the services of a qualified veterinary surgeon should be the first cost on the price of the bull.

Not long since, a bull on the North Coast was responsible for the introduction of contagious abortion into a clean herd of cattle, and all the trouble would have been saved if a blood test had been carried out before the bull was introduced into the herd.

Immunity and Relative Immunity.

Immunity means that an animal once it is infected with a disease and recovers never has a recurrence of the same disease, but is immune to this disease for the rest of its life.

Relative immunity means that an animal, once it is infected with a disease and recovers from the disease, may during its lifetime have a recurrence of the same disease, i.e., it is not a lasting immunity. With contagious abortion the animal carries a relative immunity and, in addition, remains a carrier of the disease during its lifetime and may have a recurrence of the disease in a virulent form.

SPORADIC ABORTION.

Sporadic abortion is not contagious and may be due to accidents which cannot well be avoided. Lack of phosphates in the soil, and feeding on mouldy fodder may be cited as some of many causes.

The treatment already given will answer the purpose and bring the cow back to health and in due time she will recover her normal state.

TROUBLES AFTER CALVING.

Ninety per cent. of the post-calving troubles are due to neglect of simple precautions, and the crude methods involved in dealing with the calves. The calves should be allowed to run at least for two days with their dams, as the sucking action of the calf assists in the contraction of the uterus or calf bed, and the rapid expulsion of the contents of the uterus and the return to normal of this important organ of reproduction assists the general health of the animal concerned, and gives her an opportunity to render useful service at the bucket. The calf should be at least easily accessible to the cow for the first six weeks after calving. So long as she can see her offspring she appears satisfied and content, but the call of the hungry calf which is very distressing does at all times upset the mother. There are some cows, and not always the best, that take little notice of their offspring, being more concerned with their own petty troubles. The cow which should be encouraged is one which makes it a practice of making the care and well-being of her calf a matter of constant concern, for the maternal instinct is strongly developed and, proportionately, her ability to do well at the bucket and conceive regularly at certain given intervals is greatly increased. At least for the first seven days after calving a good mother is always within earshot of her calf, and she should be allowed this as it is her natural right. If a cow has calves normally and there is little or no discharge, it is a grave mistake to interfere with her at all in the way of flooding the uterus and, except for cleansing of her tail and brush and back of the udder and perhaps the udder itself with good soap and water as soon as the calf is taken away, she should be left severely alone.

The clipping of all hair in and around the udder as far forward as the navel should be practised as a routine work on every dairy farm, for the long hairs collect the filth and predispose the large, well-developed udder to mastitis which is usually contagious.

Flooding of the uterus with blood due to hæmorrhage may take place nine days after calving, and although this is not a constant symptom it does occur and, provided it is not excessive, it could well be left alone. The calf should be fed, if possible, on mother's milk for at least three weeks before being placed on the mixed milk ration.

Septic Pneumonia Among Cows.

Septic pneumonia among aborting cows or cows which have a relative immunity to contagious abortion and have recently come into profit, or are in contact with contagious aborters is fairly common, especially among the best heavy producing cows, and frequently the response to treatment is not all that can be desired, and consequently the percentage of deaths among these cows is fairly high. On the outset of septic pneumonia the affected cows should be isolated and treated away from the main herd, and prompt action is necessary if satisfactory results are to be assured. The cows should be placed under cover, well bedded down, have easy access to ample clean water in the stall, and the services of a qualified veterinarian obtained and steps taken to bring about rapid recovery, for if the case hangs fire the profit for the year is completely lost even if the cow survives.

THE CARE OF THE CAR.

The Magneto and the Spark.

It is not unusual to hear a motorist boast that he has run 10,000 miles or more and never looked at a spark plug or had to touch his ignition system in any way.

The motorist who remembers the ignition systems of a few years ago marvels at the reliability of modern ignition systems, no matter whether they be magneto or battery and coil systems. The history of the development of the ignition system used on modern cars is of little practical value to the modern motorist, but is of interest.

The motor engines made in the last few years of last century were weird and wonderful arrangements, yet they were essentially the same as modern engines with the exception of the ignition and carburettion systems.

The "Hot Tube."

Thirty years ago very little was known of electricity and on the engines of those days various sorts of ignition devices were used. A somewhat successful type was the hot-tube ignition. This system consisted of a small tube fitted into the cylinder head. The tube was heated by an external lamp until the interior of the tube was red hot. The tube was isolated from the engine by means of a small valve, but when the mixture was compressed the valve opened and allowed the inflammable gas into the hot tube where it immediately ignited and the flame immediately blew back into the main combustion chamber and so ignited the whole of the mixture. Once the engine was started the burning of the gases inside the tube practically kept the tube hot without the use of the external blow lamp.

In order to withstand the heat at which the tubes were worked, they were made of platinum. In those days platinum had very few uses and was comparatively cheap. An engine fitted with such tubes to-day, when platinum is many times the price of gold, would need to be locked in a strong box.

Low-Tension Ignition.

About the same time as the hot-tube ignition was used the low-tension electrical system came into use. This system is still found in certain old stationary engines. A low voltage battery was used and a make-and-break was actually placed within the cylinder head. This make-and-break was so arranged that just when the ignition of the gases was required the circuit was opened and the resulting spark caused the gases to be ignited. The make-and-break was driven with a lever from the camshaft in much the same way as the valves are operated. The chief difficulty with this device was that the spindle that operated the make-and-break, together with the insulated connections, had to be kept gas-tight. Also the make-and-break was subjected to the terrific heat of the burning gases, and since it was situated within the cylinder head was not at all accessible for either cleaning or adjustment.

Originally the current for this ignition device was supplied by a battery of cells. These cells were not the same as those found in the modern battery, but were much more elaborate affairs so that the car really carried a small laboratory.

Later a magneto which generated a low-voltage current was developed and this magneto was known as a "low-tension" magneto as distinct from the modern "high-tension" magnetos. These low-tension magnetos were quite large affairs with several large permanent magnets.

Following on the low-tension system high-tension ignition systems were developed.

The essential difference between low-tension and high-tension ignition systems is that in the former the two pieces of metal causing the spark (electrodes) actually touched together and were then drawn apart so that a spark or arc resulted, while in the later such a high voltage is used that a spark will actually jump between two points separated by a sixteenth of an inch or more.

An example of the difference in the voltage required to do these two things is the following:—Every motorist has at some time or other accidentally caused a "short" on the battery of his car and has noticed that quite a violent spark results, as the "short" is removed, although the battery of the car has only six or twelve volts. On the other hand, a voltage in the neighbourhood of 10,000 volts is required to jump across the points of the average spark plug. High-tension ignition systems were first used with a make-and-break and spark coil in much the same manner as the modern coil ignition system. However, in the early days batteries were very

unreliable and generators to keep the battery charged were not available, so that the whole ignition system was unreliable. Thus when the high-tension magneto was developed it became very popular, as it was a self contained unit which generated all the electricity it required within itself.

Just prior to the war magneto ignition was almost universal on good quality cars, and the magneto had reached a high degree of perfection. The Bosch factory of Germany practically dominated the market, as the firm was the first to develop a satisfactory high-tension magneto. This same firm to-day is well to the fore in the development of fuel injectors for high-speed Diesel engines, which bid fair to be the engines of the future.

The necessity for electric light and electric starting on the modern car has caused the electrical generator and battery to be brought to a high standard of reliability, and as a result battery ignition systems using an induction coil to convert the low voltage of the battery to high voltage (high tension) are once more the prevailing favourites, although twenty years ago the magneto had practically eliminated this system.—Radiator in "The Farmer and Settler."

THE FARM TRACTOR.

THE IMPORTANCE OF DECARBONISING.

Probably the most common cause of trouble in the internal combustion motor is the formation of carbon on piston, cylinder, or valve heads, and at the end of a strenuous season a half-day may be profitably spent taking down the engine and decarbonising. This formation of carbon occurs in any internal combustion engine and is, more or less, governed by the extent to which the motor is used.

Obviously, the quality of the fuel and oil also plays an important part; but even with fuels and oils of the highest quality, carbon formation inside the motor is inevitable. The removal of this is a simple matter and should be regularly attended to, as carbon causes a variety of different troubles in the engine.

It is easy to see that a heavy formation of carbon on the piston and cylinder head reduces the compression space and correspondingly increases the compression ratio of the engine. If it is the manufacturer's idea that the compression ratio should be, say, 5 to 1, a heavy formation of carbon in the combustion chamber may increase this ratio sufficiently to cause a bad knocking, due to the heightened compression of the engine. This reduces the power of the motor, and the knocking considerably increases the wear on the working parts.

Carbon, too, is often responsible for pre-ignition. Pre-ignition means the igniting of the charge before the piston has reached the top dead centre of its stroke. The result is that the explosion occurs before it should, and the piston is met whilst still on its upward stroke with the force of the explosion causing bad knocking and undue wear.

The removal of carbon from any internal combustion engine is a simple matter, and can easily be accomplished by the tractor owner himself. The following method applies in the big majority of cases:—

First drain the radiator of water and loosen off the water connection between the radiator and the cylinder head. Remove the cylinder head bolts or nuts and carefully lift the head off, taking care not to damage the copper asbestos gasket which is between the head and the cylinder block. If this has become bent or torn in the process, it is wise to replace it with a new gasket, as no amount of straightening out or pressure will stop water from the radiator or explosive gases from seeping through the gasket, the copper lining of which has become creased. All the carbon on the cylinder head should be scraped off and the surface wiped clean with a kerosene rag. When scraping the tops of the pistons, bring each piston to the topmost point in the cylinder so that no carbon will adhere to the oil on the cylinder walls. Clean out the valve heads and ports, and see that no carbon lies between the valve and its seat. This would result in an imperfect seat and bad compression.

When the job is thoroughly clean, paint both sides of the copper asbestos gasket with shellac or gasket cement and replace the cylinder head. In tightening up the bolts, take them all up gradually so that the pressure is evenly distributed over the head. This is in order to avoid warping. Replace the water connection; refill

the radiator; and start the motor up. When it has run sufficiently to become warm, tighten up the cylinder head bolts again, as it will be found that, due to the vibration of the explosions and the expansion due to heat, the bolts can be still further tightened.

Decarbonising is an excellent job for the tractor owner on a rainy half day, and he will be amply repaid for his trouble. Obviously, the amount of carbon formed in an engine is, to a great extent, controlled by the quality of the kerosene and lubricating oil used in it.

Spark Plugs.

If an engine is giving uneven results, or is missing badly, the owner almost invariably attributes the trouble to the plugs and takes them out for inspection. This inspection, however, generally does not go much farther than the points of the plugs which, as a general rule, are not responsible for the trouble. It is not often that the points of the plug become so far contaminated with carbon to completely close up, thereby short circuiting the plug and causing it to become dead.

The most common cause of short circuit in a spark plug is through the electrode becoming covered with carbon, and becoming short circuited by this with the iron jacket of the plug. When you take the plugs out, completely scrape them inside and as far down as can be reached with a pointed scraper, such as a twine needle used for sewing wheat bags; this makes a good tool for the purpose. When the plug has been completely cleaned, pour some petrol inside it and burn it out. The points should be set to an approximate distance of $\frac{1}{32}$ of an inch. It will be found that this spacing gives the best results under all conditions.

A common cause of plug trouble is a cracked porcelain, which is often not easily discernible as the plugs, particularly on tractors, become covered with dust and dirt. The plugs should be regularly inspected every week, and their condition ascertained. We often hear of tractor owners who boast that they have never taken the plugs out of their machine in twelve months. This is extremely bad practice. A plug giving a weak spark causes only partial combustion of the charge; this results in poor power, wasteful running and excessive dilution of the crank case oil by the unburned portions of kerosene which find their way between the piston and cylinder wall into the crankcase. In order to ascertain the type of spark being given by the plugs, take them out, attach them to their connecting wires and lay them on the cylinder head. Switch on the ignition and turn the engine over fairly fast by the crank handle; and observe the sparks jumping between the plug gaps. A thin, blue spark is a weak spark. The ideal colour is red and fat. Obviously, a faulty spark may not always be due to the plug itself—it may be caused by some weakness in the ignition system.

Very often, particularly during harvest when the tractor is working full time and there is no leisure in which to give attention to mechanical details, work has to be gone ahead with an imperfectly operating machine.

Valves.

There is no doubt that the valves, particularly the exhaust valves, of internal combustion engines have to withstand greater heat than any other working part. We are dependent on them for compression and, therefore, operating efficiency; and they consequently demand from us a reasonable amount of care and attention.

In a four-cylinder tractor engine working at, say, 1,200 revolutions per minute, each inlet and exhaust valve is opening and shutting 600 times per minute, or ten times each second. The inlet valve opens to admit ten charges of gas to each cylinder per second; the exhaust valve opens to discharge ten exhausted explosions. When it is realised that the heat in the combustion chamber at the point of explosion is approximately 3,000 deg. Fahr., we begin to wonder how the exhaust valves ever retain the surface and hold the compression. Obviously, extensive use of the motor must, in time, cause the exhaust valve to become burned and pitted, resulting in loss of compression, poor power, and uneconomical running. This can only be corrected, and cannot be obviated.

The term "grinding in the valves" is familiar to all of us, but the actual method of procedure is not so well known; and, in order to assist those who would like to do the work themselves, we give the following method:—

Having removed the cylinder head, the valves should be removed from the cylinder block by releasing the valve cotters and springs. Before removing them from their seats, number each valve by lightly tapping with a punch in order that

you will be certain of putting each valve back in the pocket from which it came. Examine the valve seats in the cylinder block, and if they are badly burned or pitted they should be cleaned up with a refacing tool, which is obtainable at little cost. This is a cutting instrument which is easy to apply and which, if used properly, results in the seat being properly faced and, what is highly important, faced at the correct angle.

Having scraped the valves clean of carbon, place each one in its corresponding guide and commence grinding the seat of the valve to correspond with the seat in the cylinder block. A proper grinding paste is obtainable for this; or a very fine emery mixed with oil can be used. Apply a small portion of this to the valve seat and, using a screw driver, rub the valve into the seat with a semi-rotary motion until the grinding paste reduces the seat of the valve to a fine, even, and polished surface corresponding exactly with the seat in the cylinder block. Having accomplished this with all valves, replace springs and cotters and adjust the valve tappets to allow for clearance between the end of the valve stem and the tappet. This clearance should amount to approximately five or six thousandths of an inch. If this clearance is not allowed, the heat expands the valve and it will ride on the tappet and not on its seat, resulting in poor compression.

Regular attention to the valves is essential for economical running. Good fuel plays an important part in the amount of attention which is required to keep the valves in perfect condition. A slow-burning fuel means that, instead of hot gases being thrust past the exhaust valves, the actual flame itself meets the valve seats, and the result is more extensive and quicker pitting of these surfaces.

THE ROYAL SOCIETY OF QUEENSLAND.

MAY MEETING.

The ordinary monthly meeting was held in the Geology Lecture Theatre of the University on Monday, 26th May, at 8 p.m. Included in the attendance were Professor Sir E. T. Edgeworth David, Professor E. W. Skeats, Dr. P. Marshall, Dr. L. K. Ward, Dr. C. Fenner, Mr. J. F. Bailey, and Professor Summers.

Mr. C. T. White exhibited a specimen of the fruit of *Parinarium laurinum* A. Gray, picked up on the beach at the southern end of Moreton Bay by Mr. Densil Curtis. Fruits of this tree, which is a native of the Solomon Island and New Guinea, are sometimes picked up on the Queensland beaches, but the species so far as known has not yet succeeded in establishing itself here.

Dr. E. O. Marks read a paper entitled "The Physiographical Significance and Non-Migration of Divides."

Where, owing to comparative shortness or other denudational advantage, one stream is more active than its neighbour, it will erode its basin more rapidly, and encroach on the neighbouring basin. This shifting of the divide, known as migration or headward erosion, is generally recognised as a very active physiographical principle, and on it is based the theories of river-capture and rearrangement of drainage which figure largely in modern physiography.

In this paper it is pointed out that, according to the theory, any originally straight divide must be made crooked by the irregular action of this headward encroachment. Consequently any straight divide must have a tectonic origin and still be in its original position.

The Blackall-D'Aguilar ranges form such a straight divide, separating the group of numerous short streams running eastwards into the sea from the headwaters of the Stanley and Mary rivers. On Mount Mee and Blackall tablelands the divide is at 1,500 ft. elevation, but for 10 miles between these is about 500 ft. Here the rocks are soft and differential denudation obviously accounts for the lower elevation and different character of this part of the divide. Although the short streams have courses entirely on soft sandstone country, while the Stanley waters have 180 miles to go largely over hard rocks, and although there is clear evidence of the lowering of this part of the divide by denudation at least 1,000 ft., there has been no migration, and this in a situation where it would necessarily have occurred had the theory been correct.

Other straight divides confirm this absence of migration in situations where the theory would require it, except to such a minor degree as to render it utterly incapable of the results claimed for it.

It is necessary, therefore, that all that part of physiographical theory depending on the migration must be seriously modified if not entirely discarded.

Some inquiry is made to discover the flaw which renders the theory inconsistent with the observed results of these nature-performed experiments.

This paper was discussed by Professor Sir Edgeworth David, Drs. Ward, Fenner, Marshall, and Bryan, and Messrs. Bennett and Jones.

Mr. Perkins read extracts from a paper by B. B. Grey, entitled "Chaetognatha from the Society Islands."

The *Chaetagnatha* discussed in this paper were collected in sixteen hauls, irregularly spaced over a period of twelve months. Ten species are represented, belonging to two genera, *Sagitta* and *Pterosagitta,* including *S. oceania* n. sp. A table illustrating the coincident occurrence of the species is included. *Sagitta oceania* n. sp. is described as new to science, the description being supplemented by several text figures. The fertilisation of the *Chaetognatha* is discussed, special reference being made to observations on *S. oceania* and *S. enflata.* A brief account is given of the parasites found in four species of *Sagitta.* A meal taken by *S. enflata* is described in detail, the meal being a specimen of *S. fridrici.*

The following paper was laid on the table:—"Essential Oils from the Queensland Flora, Part 2, *Agonis abnormis,*" by T. G. H. Jones, D.Sc., and M. White, M.Sc.

Examination of the essential oil obtained from the leaves of *Agonis abnormis* (yield ·6 per cent.) has shown that it possesses the following constants:—$d_{15^{\circ}5}$, ·9040, n_D^{20}, 1·4905, $[a]$ D, +.9, Ester number 7·4 Acetyl value 16, Acid number 1·7, and is composed of a mixture of d a-pinene 30 per cent., aromadendrene 60 per cent., and a small percentage of sesquiterpene alcohols. The aromadendrene fraction is being further examined and at least two sesquiterpenes are present.

JUNE MEETING.

The ordinary monthly meeting was held in the Geology Lecture Theatre of the University on Monday, 30th June. The President, Mr. J. B. Henderson, was in the chair. Messrs. F. Barker and J. B. Wadley were unanimously elected members of the Society.

A paper, entitled "The Genus Oxyscelio: Its Synonymy and Species, with the Description of One New Genus," by Mr. A. P. Dodd, was laid on the table.

This paper discusses the characters of the Scelionid genus *Oxyscelio* Kieffer, erected with *O. foveatus* Kieffer from Java as the genotype. The genera *Camptoeleia* Kieffer, *Dicroteleia* Kieffer, and *Xenoteleia* Kieffer are regarded as synonyms of *Oxyscelio,* the reasons for making these alterations being given at length. Many species originally described or formerly placed in the genera *Sceliomorpha* Ashmead, *Hoploteleia* Ashmead, *Psilanteris* Kieffer, and *Scelio* Latreille are transferred to *Oxyscelio,* which will now contain 32 listed species from Ceylon, the Philippine Islands, Java, and Australia.

The characters of *Oxyscelio* are compared with those of related genera. A new genus, *Bracalba,* is erected to contain *Chromoteleia nigrescens* Dodd and two new species, *Bracalba laminata* and *B. cuneata,* all from Australia, *B. laminata* being selected as the genotype.

The main business of the evening was the following series of exhibits:—

Dr. L. Bagster conducted some very interesting experiments with liquid air, and showed a metallic spectrum on the lantern screen.

Mr. E. J. Wood, M.Sc., exhibited specimens of the following diseases of sugar cane from the collection of the Bureau of Sugar Experiment Stations:—(1) Physiological: Chlorosis (deficiency), banded chlorosis (the effect of cold moist nights). (2) Virus: Two specimens showing Mosaic (Fiji) disease, which, though not shown by the experimenter to be transmitted by inoculation or by insects, has X bodies which seem to indicate its virus nature. Dwarfing is a disease which seems to be new to science. It has not been reported from any other country, and 66 stools of it are known. It resembles Fiji disease in its symptoms, except that the galls are replaced by chlorotic areas somewhat similar to Mosaic. It is a phloem disease and is transmissible through sets, as has been proved by the writer, who is at present working on the etiology of the disease. Its symptoms suggest a virus disease, but artificial inoculations have not yet succeeded. (3) Bacterial: Gumming (*Bacterium vascularum*); Leaf Scald (*B. albilineans*); and Top Rot, a bacterial

disease not confined to the vascular tissue. (4) Fungal: Downy Mildew (*Sclerospora sacchari*), Pokkah Boeng, and Knife Cut (presumably *Fusarium moniliforme*). A number of root diseases of fungal origin were exhibited. Peg Leg is a butt infection of the Bundaberg-Childers areas and clayey Mackay soils. *Schizophyllum commune* is a secondary parasite of little importance. (5) Phanærogamic Parasites: *Striga* spp., which are short-lived, flourishing from December to February. (6) Teratological: Hairy Root, a rare abnormality.

Dr. D. A. Herbert exhibited: (1) Haustoria of *Olax retusa*, a phanærogamic parasite attacking *Gahnia* sp.; the haustoria were the size of a pinhead, and were collected at Burleigh, June, 1930. (2) A French bean seed with two embryos. (3) *Phragmidium disciflorum*, a rust of the rose on the variety Star of Queensland (uredospore stage). (4) A section of a stem of a liana, *vitis acetosa*, with exceptionally long and wide vessels.

On behalf of Mr. E. C. Tommerup, B.Sc., specimens were exhibited of Hoop Pine (*Araucaria Cunninghamii*) showing heat girdling, which he has investigated in conjunction with Mr. R. B. Morwood, M.Sc. The stem and crown die, the roots remain vigorous and often throw off coppice leaves at ground level. At the ground level, however, a collar-like construction is formed, and though the bark is unbroken the water supply is evidently cut off and the tree dies. Plantation trees of two or three years' establishment may be affected. The girdle is often associated with slight swellings above and below the constriction; when the bark is peeled away, dark necrotic rings may be seen above and below the lesion. This disease has been reported from Reserve 151, Neumgna, in the Bunya Mountains area, and from Reserve 220, Kilkivan. Both these areas are on the ecological limit of the rain forests and only receive about 35 inches of rain per annum, with a mean summer temperature of approximately 80 deg. F. Although Bunya Mountains area is one in which the pines are frequently affected by fungal growths, it is considered that this condition exists because the trees are struggling for a living and are more susceptible to fungal attack than are vigorous trees, rather than that the meteorological conditions of this locality are favourable to fungal incubation. The plants attacked are nearly always in exposed situations on heavy soil. Several possible factors were considered, such as wind, damping, fungus, insect injury, frost, &c., but it was eventually decided that it was primarily due to the heating effect of the soil when exposed directly to the sun's rays. Similar diseases are recorded from U.S.A. with other conifers.

Dr. J. V. Duhig, on behalf of Professor Goddard and himself, showed two fish of the species *Galaxias o'connori* (Ogilvy) which had suffered from melanosis. Dr. Duhig showed lantern slides of sections of the skin of the fish. The pigmentation was shown to be due to heavy deposits of what is believed to be melanin about the walls of rounded or oval sub-epithelial cysts, which are lined with epithelium and are, in reality, processes budded off from the skin epithelium. Another section showed these cysts to contain a parasite, which Dr. Goddard stated to be the metacercaria stage of a trematode, *Clonorchis* (? species). A section was shown demonstrating the ventral sucker by which the genus could be identified. The fish is the second intermediate host of the parasite and the authors propose to continue their investigations in the direction of feeding experiments in order to secure the adult worm. To this end they desire specimens of sick fish which are well pigmented. The exhibit had a double interest, in that it raised the problem of melanin production and the subject of the exhibit was an indigenous species to which little attention had been paid.

Mr. C. T. White exhibited specimens of *Datura ferox* Linn. from Clermont, Central Queensland. The species, which is supposed to be a native of Spain and Sicily, was first collected in Queensland at Macalister, Western Darling Downs, by E. W. Bick about March, 1916. Since then it has spread to other places, but Clermont represents the northernmost locality so far recorded.

Professor H. C. Richards, D.Sc., exhibited several beautiful specimens collected by Mr. A. N. Falk of the zeolite Natrolite, from vughs within the weathered olivine basalt on the Main Range some 2 to 3 miles south-east of Toowoomba. He offered remarks upon the origin of the mineral, its crystalline habit, and how it may be distinguished from other zeolites.

Mr. E. W. Bick exhibited a specimen of flowers of *Spathodea campanulata*, the tulip-tree of West Africa. The unopened flower-buds of this species contain a considerable quantity of water of glandular origin. The plant is sometimes known as the fountain-tree on account of the behaviour of the buds when punctured.

Mr. J. E. Young exhibited matted fibrous roots of *Casuarina suberosa*, which had grown in a blanket-like mass in the crevices of consolidated sand on Stradbroke Island.

ABSTRACTS AND REVIEWS.

Fungous Diseases of Plants.

Jacob Ericksson 2nd ed., Bailliere, Tindall and Cox, London, 1930, 35s. A recent addition to the library Ericksson: Fungous Diseases of Plants.

This book covers a very comprehensive field describing clearly all the more important European plant diseases and giving in most cases the recognised control measures. A short bibliography is appended to the disease under discussion. Briefer reference is also made to the symptoms and etiology of the less common diseases.

Elementary Practical Agricultural Chemistry.

E. M. Joiner, B.Sc., Senior Science Master, Dookie Agricultural College, Victoria, Robertson and Mullens, Ltd., Melbourne, 6s.

A useful little book suited to any student of agriculture who seeks a knowledge of simple analytical operations for the testing of products used in agriculture, both qualitatively and quantitatively.

Live Stock of the Farm. (6 Vols.)

Edited by Professor C. Bryner Jones, M.Sc., F.H.A.S., Agricultural Commissioner for Wales under the Board of Agriculture and Fisheries (Great Britain), and Chairman of the Welsh Agricultural Council. Gresham Publishing Company, Limited, London. Queensland Book Depôt, £2 set.

The subject of this work is of great importance to Australia. The value of stock breeding has never been so widely recognised as at the present time, nor has it in its many aspects received closer or more general attention. Schemes for stock improvement, and the means for the investigation of scientific problems connected with animal husbandry are comparatively new movements in this country, which will certainly be attended in time with far-reaching results. Already they have invested the work of stock breeding with an interest and a significance in our national outlook.

Every part and aspect of the subject is dealt with, as far as possible, in a manner consistent with the object in view in these fine and well printed and illustrated volumes. They include the work of many writers, each a specialist in his subject, whose name is well known to breeders in every stock-raising country. The whole work is a comprehensive, complete, and practical treatise on Live Stock on the Farm. The editor, contributors, and publisher alike have obviously spared no effort to make it, whether in its general conception, its arrangement, or the character of its contents, a really useful book of reference to the farmer and stock breeder.

Each volume of the set of six is replete with many plates depicting typical specimens of the breeds of livestock with which it deals. Volume I. covers the Principles of Breeding; Breeds of British Cattle; the Improvement of Cattle; and the Selection and Judging of Cattle. The contents of the other volumes include:—Volume II.—The General Management of Cattle. The Feeding of Cattle. The General Principles of Animal Nutrition. Diseases of Cattle. Volume III.—Breeds of Horses. The General Managament and Feeding of Heavy Horses. The Management of Light Horses. Common Diseases of the Horse. Volume IV.—Sheep Farming. Breeds of Sheep. General Management and Feeding of Sheep. Diseases of Sheep. Volume V.—Breeds of British Pigs. The Management and Feeding of Pigs. Bacon Curing. Diseases of Pigs. Breeds of Poultry. The Management and Feeding of Poultry. Profitable Poultry Farming. Diseases of Poultry. Volume VI.—Bees and their Management. Goats and their Management. Dogs and their Management. Ferrets and their Management. Asses and Mules.

A comprehensive index completes a very useful work that should find a place on every farmer's book shelf.

Our copy is from the Queensland Book Depôt, Epworth House, 232-4 Albert street, Brisbane.

Through the advantage of a special purchase the management of the Queensland Book Depôt is able to offer the complete set for £2, a charge very much below the publishing price.

The Young Farmer.

NOTES ON CALF FEEDING.

Contributed by C. F. McGRATH, Supervisor of Dairying.

No fixed rules can be laid down for the feeding of calves, because the feeding depends not only upon the age of the calf, but also upon its size, health, and vigour. Therefore the quantities of feed mentioned in the following table are to be taken as guides only—to be decreased or increased according to the experience gained from the feeding of any individual calf.

The young calf has a small stomach, and the calf when running with its mother takes milk frequently and in small quantities. Therefore, in hand feeding, the greatest care must be taken not to over feed with milk of any description. Too large an allowance of milk produces indigestion and scour.

When a young calf has been without feed for some hours and is then allowed to take as much milk as it will, it is apt to gorge itself, thus causing digestive troubles.

Milk.

A calf, weighing somewhere about 50 lb. at birth, for the first few days should be given from 5 to 8 lb. per day of its mother's milk, divided amongst four feedings. Somewhat more is given to a calf weighing about 100 lb. at birth—viz., 8 to 10 lb. per day of the mother's milk distributed over four feedings.

All milk fed should be at blood heat—viz., from 95 deg. to 100 deg. Fahr.

If the calf is healthy and strong, at about ten days old the whole milk may be gradually replaced with separated milk.

Grain.

When from two to three weeks old the calf can be taught to eat ground grains or concentrates, by placing a little of the ground grain or concentrate at the bottom of the tin from which the calf has just finished drinking its milk.

Ground grains include such material as maize meal, bran and pollard, ground oats, Kaffir corn meal, barley meal, &c. Better results are obtained by feeding a mixture of grain, than by feeding one grain alone.

Concentrates.

Concentrates include linseed, cocoanut and peanut cake and meals, and calf foods.

When the concentrate is entirely linseed meal it must be first mixed to a smooth paste with a little water, then more water added and the mixture boiled from ten to twenty minutes, before being fed to young calves.

Feeding Tables.

As before stated, the following tables are to be used as guides only. The time when feeding milk should stop depends upon a number of conditions—viz., whether the calf is strong and healthy, and if food other than milk, such as good hay and grain and young pasture is available.

As a rule, not more than 18 to 20 lb. of milk per day are fed to calves.

The amount of lucerne hay given to young calves should not be excessive, as such excess is liable to cause scour.

Any uneaten lucerne, oaten or wheaten hay or chaff, ground grain, or concentrate, should be removed and feeding vessels cleaned, and fresh material given for the next feed.

Additional Mineral Requirements.

A mixture of 1 part by weight of salt with 2 parts by weight of finely sterilised bonemeal or 2 parts of finely ground Nauru phosphate should be dusted over the ground grain or concentrate ration.

Substitute for Separated Milk.

If separated milk is not available, dried skim milk powder, or dried butter milk may be used by taking 1 lb. of either of these materials and mixing with 9 lb. of water, and using such mixture in the same way as separated milk is used in Table No. 1 or Table No. 2.

TABLE No. 1.—Feeding Cod-liver Oil and Ground Grains in addition to Milk, Hay, and Pasture.

(Compiled by E. H. Gurney, Senior Analyst.)

Age.	Feeding Period per day.	Whole Milk per day.	Separated Milk per day.	Clean Water.	Cod-liver Oil per day.	Ground Grains per day.	Hay.	Pasture.
		Lb.	Lb.					
1 week..	3 times	8·0	..	..	..	..	..	..
10 days..	Twice	8·5	0·5	..	..	..	..	..
11 days..	ditto	8·0	1·5	..	..	..	..	..
12 days..	ditto	7·5	2·5	..	..	..	..	..
13 days..	ditto	7·0	3·5	..	..	..	..	..
14 days..	ditto	6·0	4·5	Access to	2 tea-spoonful	A little	A little	..
15 days..	ditto	5·0	5·5	ditto ..	ditto ..	ditto	ditto	..
16 days..	ditto	4·0	6·5	ditto ..	4 tea-spoonful	ditto	ditto	..
17 days..	ditto	3·0	7·5	ditto ..	ditto ..	ditto	ditto	..
18 days..	ditto	2·0	8·5	ditto	2 table-spoonful	ditto	ditto	..
19 days..	ditto	1·0	9·5	ditto ..	ditto ..	ditto	ditto	..
20 days..	ditto	0·5	10·5	ditto ..	ditto ..	ditto	ditto	..
21 days..	ditto	..	12·0	ditto ..	3 table-spoonful	5 to 6 oz.	*Ad lib.*	On pasture
22 days..	ditto	..	13·0	ditto ..	ditto ..	ditto	ditto	ditto
23 days..	ditto	..	14·0	ditto ..	ditto ..	ditto	ditto	ditto
24 days..	ditto	..	15·0	ditto ..	ditto ..	ditto	ditto	ditto
25 days..	ditto	..	15·0	ditto ..	ditto ..	ditto	ditto	ditto
26 days..	ditto	..	16·0	ditto ..	ditto ..	ditto	ditto	ditto
27 days..	ditto	..	17·0	ditto ..	ditto ..	ditto	ditto	ditto
28 days..	ditto	..	18·0	ditto ..	ditto ..	ditto	ditto	ditto
5 weeks	ditto	..	20·0	ditto ..	ditto ..	ditto	ditto	ditto
6 weeks	ditto	..	20·0	ditto ..	ditto ..	8 oz.	ditto	ditto
2 months	ditto	..	20·0	ditto ..	..	1 lb.	ditto	ditto
3 months	ditto	..	20·0	ditto ..	..	1½ to 2 lb.	ditto	ditto
6 months	ditto	..	20·0	ditto ..	..	2 lb.	ditto	ditto

TABLE No. 2—Feeding Concentrates in addition to Milk, Hay, and Pasture.

Age.	Feeding Period per day.	Whole Milk per day.	Separated Milk per day.	Clean Water.	Concentrate per day.	Hay.	Pasture.
		Lb.	Lb.				
1 week..	3 times	8·0	..	..	..	..	..
10 days ..	Twice	8·5	0·5	..	..	..	..
11 days ..	ditto	8·0	1·5	..	..	..	..
12 days ..	ditto	7·5	2·5	..	..	..	..
13 days ..	ditto	7·0	3·5	..	..	..	..
14 days ..	ditto	6·0	4·5	Access to	A little ..	A little ..	..
15 days ..	ditto	5·0	5·5	ditto ..	ditto ..	ditto ..	..
16 days ..	ditto	4·0	6·5	ditto ..	ditto ..	ditto ..	..
17 days ..	ditto	3·0	7·5	ditto ..	ditto ..	ditto ..	..
18 days ..	ditto	2·0	8·5	ditto ..	ditto ..	ditto ..	..
19 days ..	ditto	1·0	9·5	ditto ..	ditto ..	ditto ..	.
20 days ..	ditto	0·5	10·5	ditto ..	ditto ..	ditto ..	..
21 days ..	ditto	..	12·0	ditto ..	5 to 6 oz. ..	*Ad lib.* ..	On pasture
22 days ..	ditto	..	13·0	ditto ..	ditto ..	ditto ..	ditto
23 days ..	ditto	..	14·0	ditto ..	ditto ..	ditto ..	ditto
24 days ..	ditto	..	15·0	ditto ..	ditto ..	ditto ..	ditto
25 days ..	ditto	..	15·0	ditto ..	ditto ..	ditto ..	ditto
26 days ..	ditto	..	16·0	ditto ..	ditto ..	ditto ..	ditto
27 days ..	ditto	..	17·0	ditto ..	ditto ..	ditto ..	ditto
28 days ..	ditto	..	18·0	ditto ..	ditto ..	ditto ..	ditto
5 weeks	ditto	..	20·0	ditto ..	ditto ..	ditto ..	ditto
6 weeks	ditto	..	20·0	ditto ..	8 oz. ..	ditto ..	ditto
2 months	ditto	..	..	ditto ..	1 lb. ..	ditto ..	ditto
3 months	ditto	..	..	ditto ..	1½ to 2 lb.	ditto ..	ditto
6 months	ditto	..	..	ditto ..	2 lb. ..	ditto ..	ditto

Answers to Correspondents.

BOTANY.

The following answers have been selected from the outgoing mail of the Government Botanist, Mr. C. T. White, F.L.S.:—

"Thorn Apple."

L.D.C. (Emerald)—

The specimen is *Datura ferox*, a species of thorn apple, an ill-smelling, coarse annual weed that first made its appearance on the Western Darling Downs about 1916. Since then it has spread, though rather slowly, to other parts of the State. The whole plant, like others of the genus is poisonous. We cannot say how the plant came here, and there is some doubt about its native country. It is generally regarded, however, as native to Spain and Sicily. Attention was drawn to the plant by means of an article and illustration which appeared in the "Queensland Agricultural Journal" for July, 1917.

Mission, Sour, or Yellow Grass.

A.H.K. (Woombye)—

Your specimen is *Paspalum conjugatum*, the Mission Grass, or more commonly known in Queensland as Sour Grass or Yellow Grass. On the Atherton Tableland, where this grass is very abundant, it is looked upon as very poor fodder for dairy cattle, and also tends to overrun a pasture to the exclusion of better grasses such as ordinary Paspalum and Rhodes. Cows are said to milk very poorly on it. The grass is very common throughout the Pacific, and we have seen working mules in New Guinea do quite well on it in the absence of other fodder. Nevertheless, the experience of practical dairy farmers in Queensland is that the grass is practically useless from a dairying standpoint. Seed is not stocked by the nurserymen.

Wood-Sorrel.

V.J.B. (Miles)—

Your specimen is not a clover, but *Oxalis corniculata*, a species of wood-sorrel. It has no particular value as a fodder.

Grass (*Neurachne*) Identified.

N.A.R.P. (Townsville)—

Your specimen of grass is an undescribed species of *Neurachne*. I collected some of the grass myself some years ago at Barcaldine. It will be named and described when Mr. Hubbard is publishing his account of the Queensland grasses. The genus is only a small one but contains some quite good fodders, one of the best known of which is *Neurachne Mitchelliana*, the so-called Mulga Mitchell moderately abundant in parts of South-western Queensland and Northern New South Wales.

Black Mauritius Bean.

F.A.G. (Townsville)—

The name of the bean from Innisfail is *Stezolobium aterrimum*, popularly known in Queensland as the Black Mauritius Bean, fairly extensively grown throughout the tropics as a green manure, especially for cane fields. The plant has long been known in cultivation, but its exact native country is not known. The beans, so far as we know, have no value at all as food for stock. The bean is sometimes confused with the Florida Velvet Bean, but this is really a different plant.

Alton Downs Blue Grass (*Andropogon nodosus*).

G.B.B. (Rockhampton)—

Your specimen of grass has been determined by Mr. Hubbard, of the Kew staff, who is now in Brisbane working on Queensland grasses, as *Andropogon nodosus*, a native of India. In the nomenclature now adopted the name of the grass would be *Dichanthium nodosum*, the genus *Andropogon* as understood by older authors having been divided up into a large number of

smaller ones. The species was originally described from specimens collected in Mauritius. It has also been found in India, Bourbon, Rhodesia, New Caledonia, and the West Indies. It is probably a native of India and has been introduced elsewhere. Lisboa (List of Bombay Grasses) states that it is used as a fodder in the Bombay district. Specimens were first sent to the Herbarium in May, 1917, from Alton Downs by Mr. Brooks. Later (March, 1926) it was received from Mr. A. H. W. Cunningham, of Strathmere, Bowen. Mr. Quodling forwarded specimens last April which he had collected from the grass plots at Archer. He gave the common name as "Alton Downs Blue Grass." The specimen was then named *Andropogon annulatus.* The latter is a distinct Indian and African species, and has not been found in Queensland. This grass has been usually placed as a variety of *Andropogon caricosus* L. It differs from that species in its more robust habit, longer awns, and in the peduncles of the racemes and the apex of the culms being densely pubescent.

Needle Burr.

R. S. (Bundaberg)—

Your specimen is *Amarantus spinosus,* a native of tropical Asia, a common annual weed in most tropical and sub-tropical countries, including Queensland. It is most popularly known in Queensland as needle burr, and is most abundant on the Atherton Tableland. It is not poisonous in any way, as a matter of fact is recorded as being used as spinach by the Asiatics in times of scarcity of food. A number of weeds allied to it, common in India and Australia, are used in the same way.

Grasses—*Chloris barabata,* a Native Panicum. *Crotalaria striata.*

J.H. (Cairns)—

The grass with the purplish seed-heads is *Chloris barabata,* a species allied to the Rhodes grass and very common in Central and North Queensland. Some years ago it was boomed somewhat as a fodder, but later experiences did not seem to bear this out. The smaller grass is *Panicum distachorum,* a native Panic grass, rather valuable both for forage and hay purposes. The weed is *Crotalaria striata*, a plant poisonous to stock, though apparently not often eaten by them. A pamphlet reprinted from the "Queensland Agricultural Journal" has been posted for your information.

Stagger Weed. Mallow.

C.F.W. (Kingaroy)—

Of your two specimens, one in flower is the Stagger Weed, *Stachys arvensis*, a very common weed in cultivation paddocks in Queensland and proved by feeding experiments to cause "staggers" in working stock. Resting stock such as dairy cows do not seem to become affected by it. It is also commonly known as Wild Mint or Mint Weed, though this name is applied to a number of allied plants in addition. The other specimen bore neither flower nor seed, but we should say it represents a seedling growth of the common Mallow, *Malva parviflora,* which has been proved to cause "shivers" or "staggers" in stock also, as proved by feeding experiments in New South Wales, but we have never heard of any trouble being caused by the plant in Queensland. We think it is only when the plant is in very great abundance and of a very tall vigorous growth that any trouble is experienced.

Polypore (fungus).

D.A.W. (Fraser Island)—

The specimen represents the underground or mycelial stage of a species of Polypore. The Polypores are fungi found both growing in the ground and on trees and dead wood. Their chief characteristic is that the spore-bearing surface is covered with a number of minute pores or pits. These underground tubers are occasionally dug up in Australia and are generally regarded as representing one species, *Polyporus Mylittae,* but that cannot be proved of course, as fruiting buds are so rarely produced. The fruiting bud comes up in the form of mushroom-like plants above the surface of the ground. They have been known to send out these fruiting buds when put away in museum cases. The tubers are supposed to have been eaten by the natives in the early days, hence the name, sometimes applied, of Blackfellow's Bread.

Poison Peach. *Cassia.*

M.K. (Mt. Fox, Ingham)—

If you wish to learn the names of the various weeds and undergrowth on your property and the report on their properties, we would advise you to send specimens for identification. The specimens should consist of a shoot a few inches long and bearing either flowers or seeds; they should be dried flat between sheets of newspaper for a few days before sending. They should also be numbered, a duplicate being kept similarly numbered for checking for identification when the report on them is received.

The plant you describe as Wild Peach or Poison Peach is *Trema aspera*, generally regarded as very poisonous, though we have at times seen stock eat freely of the plant without ill-effects following. The trouble is the formation in the leaves of a prussic-acid-yielding glucoside which only occurs now and again, and what controls its presence and absence is not known. The plant you describe as Arsenic Bush is, we should say, a species of *Cassia*. This plant generally causes severe purging in stock if eaten in quantity, but on the whole no ill-effects follow.

Grasses, North Queensland Coastal Country.

INQUIRER (Innisfail)—

Rice Grass (*Spartina Townsendii*) is quite unsuitable for your locality. It is essentially a cold country plant and we are practically certain that the climate, even as far south as Brisbane, is too hot for it. Probably for your purpose the best grass is *Panicum muticum*, common everywhere in North Queensland and generally regarded as a valuable grass for binding river banks. It has the advantage of being a very rapid grower. Another grass that could be tried is the common Buffalo Grass (*Stenotaphrum americanum*). Where land is muddy and subject to covering by the tide you could try the Common Reed (*Phragmites communis*). This species grows quite well in moderately salt water and is fairly common in parts of North Queensland. We do not remember seeing it on the Johnstone, but it is almost sure to be there, as it is fairly common about Cairns. You mention small bamboos. These are worth trying, but for rapidity of growth probably the Spanish Reed, some times called the Small Bamboo in Queensland (*Arundo donax*) would be worth planting. You do not state whether soil is muddy or sandy, but we think it would be advisable to make at least trial plots of all these grasses.

Bird's-foot Trefoil.

INQUIRER (Sydney, N.S.W.)—

Bird's-foot Trefoil (*Lotus australis*) is more a constituent of Southern pastures than it is in Queensland, though it does grow here practically everywhere, though not usually in very large quantities. It has been proved poisonous, the poisonous property being a prussic acid yielding glucoside, such as is present in young Sorghum and some other plants. It is poisonous to stock, especially if eaten in quantities and on an empty stomach. We cannot say the exact amount necessary to kill a beast, but in any case this would vary very considerably with the condition of the animal. Possibly quiet browsing stock would be unaffected by it, as they so often are by these prussic acid producing plants.

Measurement of Log Timber.

J.H.P. (Buderim)—

To find the superficial feet of timber in a tree, take one-quarter of the circumference or girth in inches, multiply by itself, then multiply by the length of the log in feet, and divide by 12; or, if the girth does not divide by four evenly, multiply the full girth in inches by itself, and by the length in feet, and divide by 192. That is the general rule in use by Queensland timber men. A log 50 inches in girth and 20 feet long would yield by this method of calculation 260 superficial feet.

General Notes.

Staff Changes and Appointments.

Mr. J. J. Purcell, Temporary Stock Assistant, has been exempted from the operations of Section 18 (3) (*v*) of the Public Service Acts, and his services have been continued for the period from the 1st July, 1930, to the 31st December, 1930.

Messrs. C. A. M. Reid and C. J. Loseby, of Indooroopilly, have been appointed Honorary Rangers under and for the purposes of the Animals and Birds Acts for the newly created Sanctuary at "Lone Pine."

Mr. C. Dorrell (Yanko Station, via Thargomindah), Mr. E. G. Conrick (Nappamerrie Station, via Nocundra), and Mr. M. A. Seagar (Daymar, via Thallon), have been appointed Honorary Inspectors of Stock as from the 19th July. Mr. W. C. Mylrea, of Leura Station, via Marlborough, has been appointed an Honorary Ranger under the Animals and Birds Acts. The services of Messrs. F. C. Shaw and P. J. Short, Temporary Inspectors of Slaughterhouses at Cairns and Warwick respectively, have been continued from the 1st July to the 31st August.

Mr. K. V. Henderson, Field Assistant, Callide Cotton Research Station, Biloela, has been transferred to Waratah, in the Upper Burnett District.

Mr. H. Flanagan, Inspector of Slaughter-houses, Bundaberg, has been appointed also an Inspector of Brands.

The Brisbane Show.

The House of Pike Brothers, Queen street, extends to country visitors for the Show a cordial invitation to call and make themselves known. Many different departments at Pike Brothers cater completely for the man out of town and many visitors make it a regular practice to stroll through the store and note the many items of apparel that are introduced for their especial benefit from time to time.

Sanctuary for Animals and Birds—Brisbane Catchment Area.

An Order in Council has been issued under the Animals and Birds Acts declaring the Brisbane Water Catchment Area, Mount Coot-tha Reserve, and adjoining lands to be a Sanctuary under the Animals and Birds Acts.

Most of this land has been declared sanctuaries at various times since 1885, and the new Order in Council consolidates the blocks into one sanctuary, with the addition thereto of certain other blocks. Roughly, the sanctuary now takes in the whole of the parish of Kholo, and portions of the parishes of Chuwar, Sahl, Samford, Enoggera, Indooroopilly, and Moggill.

Maps of the sanctuary are being prepared, and these will be displayed at suitable places on the lands concerned.

Tomato Packing—A Handy Wall Chart.

A very useful wall chart, compiled by the Instructor in Fruit Packing, Mr. Jas. H. Gregory, is now on issue to tomato growers at the Head Office of the Department of Agriculture and Stock. As most growers know, correct height and compactness of fruit are essential in the successful carriage and marketing of fruit. In this chart, Mr. Gregory shows, by well reproduced photographs and diagrams, the right way to pack fruit in a simple and graphic way. Every tomato-grower should find a place for it on the wall of his packing shed for ready reference. Application for a copy should be made to the Under Secretary, Department of Agriculture and Stock, Brisbane.

Sectional Group Committee Elections.

On the 8th August, 1929, Regulations 73 to 77 under the Fruit Marketing Organisation Acts, setting out the electorates for the annual elections of the Banana, Pineapple, Citrus, Deciduous, and Other Fruits Sectional Group Committees, were approved. For the elections this year, in the cases of the Pineapple, Citrus, and Other Fruits, the electorate boundaries are slightly different. Accordingly Regulations have been issued rescinding Regulations 74, 75, and 77 made last year, and substituting new ones. These new regulations set out the electorates which will be recognised in the forthcoming elections of the Pineapple, Citrus, and Other Fruits Sectional Group Committees. The electorates recognised in 1929 for the Banana and Deciduous Committees will be again recognised this year.

Sanctuaries for Animals and Birds.

The following places have been proclaimed Sanctuaries under and for the purposes of the Animals and Birds Acts, in which it will be unlawful to kill or capture any Native Bird or Animal:—

(1) The property of Mr. C. A. M. Reid, at Indooroopilly, known as "Lone Pine," a tourist resort, comprising an area of about 32 acres, consisting of portions 130, 138, and 139, parish of Indooroopilly, county of Stanley;

(2) Reserve for Abattoirs, Wolston, R. 1230, parish of Woogaroo, county of Stanley, comprising an area of about 223 acres 2 roods;

(3) Part of the property of Mr. St. J. Robinson, known as "Mount St. John," on the Ingham road, near Townsville, comprising an area of 426 acres, consisting of resubdivision 2 of subdivision 2 of portion 77, parish of Coonanbelah, county of Elphinstone.

Subsidy to Agricultural Societies.

Up to the present, under the Regulations governing the payment of subsidy to Agricultural and Horticultural Societies, no subsidy has been payable to any society, other than those in existence before the 1st July, 1890, which has been or shall be established within a radius of twenty miles of any place in which there is a society in existence. A Regulation has now been passed rescinding the relevant Regulation, so that in future subsidy may be payable to any society established within a radius of twenty miles of any place where a society has already been established.

Baby Beef.

"The baby beef craze is said to have hit the Pacific Coast," a Chicago live stock market paper remarks editorially in a recent issue. There was a time, quite a few years ago, when the demand for baby beef might have been, with some show of justification, denominated as a "craze." The fact is that the trend towards baby beef in recent years has been about the clearest manifestation of sanity in relation to food buying that has been made by any class of consumers. It has been in line with changing living and housing conditions. It made the housewife's money go farther in the purchase of foods, and kept beef on the menu of many a home. It has rebounded to the benefit of the producer of beef cattle, making possible a quicker turnover and eliminating much of the hazard of beef making. If baby beef making is a "craze," it is to be hoped that other lapses from sanity equally as beneficial to the cattle industry and the beef consumers will occur at frequent intervals, says the editor of "The Hereford Journal" in U.S.A.

State Wheat Pool Election Regulations.

Regulations under "*The Wheat Pool Acts*, 1920 *to* 1928," have been issued rescinding the old State Wheat Pool Election Regulations made in 1926, and substituting new ones therefor. The new Regulations differ from the old ones in the following particulars:—

(*a*) The Minister may now appoint a returning officer to conduct elections, whereas previously the Under Secretary conducted any election.

(*b*) The growers' representatives will be appointed for a period of two years, the first of such periods to commence on the 1st September, 1930; the present Board holds office for one year only.

(*c*) Each representative must now be a bona fide wheatgrower; under the old system, any person is entitled to election as growers' representative on the Board.

(*d*) The Minister may publish the notice calling for nominations, the nominations received, and the result of the elections, in such newspapers as he thinks fit, but in at least one paper circulating in each district; in the revoked Regulations certain papers are specified for each district in which such notices must be published.

(*e*) The voting at all elections will be preferential; under the old system preferential voting is optional.

(*f*) Questions arising in connection with any election shall be decided by the returning officer, not by the Under Secretary as has, until the present, been the case.

(*g*) The Minister has now the power to declare any election invalid, and order another; under the old system he had no such power.

Finance for Barley Board.

An Order in Council has been issued to provide for finance for the Barley Board. This Order sets out the conditions under which the Board may borrow moneys to enable it to carry on its operations, and the manner in which securities may be granted. The conditions are the same as those applied to other Commodity Boards.

The Queensland Canary Seed Board—The Season's Returns.

The Queensland Canary Seed Board completed all operations in relation to 1929-30 crop by 30th June. Board accounts were closed expeditiously, and pool costs were moderate, thus enabling a payment to growers of £28 15s. a ton net, that cannot be other than satisfactory. There came to the pool 280 tons 2 cwt. 3 qr. 14 lb.; the cleanings and gradings totalled 29 tons 2 cwt. 2 qr. 16 lb.; this includes wastage from two especially dirty lots. From one of these lots there was 55 cwt. of wastage through mildew, convulvulus, black oats, and an unknown seed which was most difficult to eliminate. This consignment was put through the cleaning machines several times before it was marketable. Another consignment opened up badly, and a very big parcel of gradings was sent back to the consignor.

The character and quality of the seed is such as to encourage its extensive cultivation, and if given a continuance of the of the well-warranted embargo it will be found a profitable crop to grow. It is doubtful if any other crop yields as good a net cash return. The greatest charge against the 1929-30 crop was the wastage, also the attendant cost of cleaning and grading. In many cases repeated cleaning was necessary, as the Board was determined to market a seed that would in every way compare with Moroccan and other imported seed. The Board earnestly emphasises that if the paddocks are kept clean, weeds kept down, and greater care exercised in harvesting operations, a tremendous wastage would be saved and profit correspondingly increased to the grower. A large proportion of the wastage is made up of broken seed; surely a little care exercised in machine adjustments would well repay the grower and save the seed. A little reflection on the part of growers will convince them that, apart from the loss occasioned by cost of extra cleanings and gradings, there also is the cost of railage on this wastage.

After 1st December, no imported seed will be accepted at any port in the Commonwealth, so it is up to the Darling Downs farmers to honour the confidence which the Federal Government has shown in their splendid soil and climate, and grow at least all the seed that the Commonwealth consumes. The soil will produce the crop; the grower should therefore do his part and market tip-top canary seed. The Australian market can absorb about 1,500 tons of canary seed during the year, so there is plenty of margin for increased acreage.

A New Sanctuary for Native Birds.

Murray's Lagoon, near Rockhampton, was declared to be a Sanctuary for the protection of Native Birds in 1904. An Order in Council has now been passed rescinding this declaration, and declaring Reserve R. 217 (area 690 acres) containing Murray's, Yeppoon, and Crescent Lagoons, parish of Rockhampton, county of Livingstone, to be a Sanctuary under the Animals and Birds Acts, in which it shall be unlawful for any person to take or kill any animal or bird.

No Open Season for Opossums.

The Minister for Agriculture and Stock (Mr. H. F. Walker) has announced for the benefit of trappers and other interested parties, that he desires it to be definitely understood that an open season will not be proclaimed for opossums during the present year. He desires also to point out that no traffic in opossum skins will be permitted, and in this connection the co-operation of the Police and the Railway Department has been sought. The Minister also wishes to impress on trappers the fact that sales of opossum skins cannot be conducted until an open season is again proclaimed.

Regulations under the Farm Produce Agent Actss.

Regulations have been passed under the Farm Produce Agents Acts rescinding all previous Regulations and substituting new ones therefor. The chief difference between the old and new is that the new ones clearly specify the nature of books to be kept by a produce agent. The Registrar, however, is empowered to exempt any agent from adhering to the particular form of accountancy mentioned, provided that the system in use enables all sales to be properly traced. It is now compulsory for an agent to keep all his books and documents at night in a fire-proof safe.

Papaw Levy Regulations.

In 1928 a levy was made on all papaws, for advertising purposes. At the end of 1929 there was an amount of £143 debit outstanding, which has been spent by the Committee of Direction on the growers' behalf. In response to a request from two Local Producers Associations, the Committee of Direction conducted a ballot of papaw growers on the question as to whether a levy be struck again this year in order to wipe off the debt. A total of 226 ballot-papers were posted, and 116 were completed and returned, of which 94 were in favour and 22 against the levy. The Committee of Direction accordingly recommended that additional Regulations be issued under the Fruit Marketing Organisation Acts to provide for this levy, for advertising purposes. As a result, the Governor in Council has now approved that Regulations 189 to 199 under the Acts referred to be issued to provide for a levy on papaws by the Committee of Direction.

The levy shall be payable by growers of papaws marketed from the 26th June, 1930, to the 27th June, 1931, at the rate of one penny per bushel case. The levy shall be collected by all agents, and paid to the Committee of Direction fortnightly. In the case of papaws sold privately, the grower must furnish monthly a statement of realisation of such sales, and pay to the Committee of Direction the amount of levy due. The books of any agent may be inspected by any authorised officer of the Committee of Direction to ascertain whether the Regulations are being complied with. Any person failing to pay the levy, or otherwise committing a breach of these Regulations, shall be guilty of an offence, and be liable to a penalty not exceeding £20.

Swine Fever.

In an address at a recent meeting of the Pig Industry Committee of New South Wales, Dr. H. R. Seddon, Director of the Glenfield Veterinary Research Station, New South Wales, stated that fresh pork may maintain its infectivity for seventy-three days, and it is possible that, under certain circumstances, this period may be longer. So far, all experiments aiming to show that bacon made from infected pigs could spread the disease have been negative, but, of course, that does not prove that bacon and ham are always harmless. It is certain, however, that the danger from bacon, &c., is nowhere near so great as that from fresh or frozen pork.

Mildew on Bacon.

One of the objections to farm-cured bacon is that there is great difficulty in preventing the development of a heavy growth of mould on the cured surfaces after the curing, drying, and smoking processes are complete and the bacon is stored away for future use. The trouble is not a new one; indeed, it has been a source of annoyance both to bacon factories, provision stores, and the farming community for many years, and much loss has been occasioned in subsequently freshening up and trimming goods so affected. Curers and chemists alike have for ages been puzzled over the rapid growth of the mould, but in recent years research has paved the way to much better results, through which, nowadays, there is not nearly the same amount of trouble as formerly. It is apparent that the mildew which develops after the smoking process is complete and the bacon has been stored is largely due to an excess of moisture both in the meat and in the atmosphere. Bacon is not the only class of goods that suffers, especially in the semi-tropical and tropical districts. Some curers even believe that the growth of mildew is encouraged by insufficient even though prolonged drying of the meat, and by the smoking process being carried out in a room or portion thereof which does not allow of rapid and thorough smoking; for bacon is often smoked by merely being hung up on rafters in a smoky kitchen or by being hung up in a chimney away from the heat, yet in the track of the smoke from a continuous fire.

The trouble is not so apparent in cold climates or in dry years, but must be looked for in most parts of Australia, especially during moist or humid seasons. Removal of the mould does not necessarily ruin the bacon or reduce its value, nor does the growth of the mould indicate decomposition, or that the meat is unfit for use, for the mildew is readily cleaned off, and if the meat is then thoroughly dried and rubbed over with a cloth soaked in olive or salad oil it will keep clean for quite a long time. In fact, the growth of mould would be checked very largely if this precaution of oiling be taken in the first instance, as soon as the smoking is complete and the meat has cooled off.

Storing in a dry atmosphere where the temperature is normal to cool will also be effective, though even under the best management there will be a limited growth of mould or mildew in due course. Provided the meat has not been otherwise neglected or depreciated in value and is in good state of prservation, there is no occasion to seriously worry over the appearance of mould.

The Home and the Garden.

OUR BABIES.

Under this heading a series of short articles by the Medical and Nursing Staff of the Queensland Baby Clinics, dealing with the welfare and care of babies, has been planned in the hope of maintaining their health, increasing their happiness, and decreasing the number of avoidable cases of infant mortality.

DIPHTHERIA.

Of all the epidemic diseases which attack our children, diphtheria is the most treacherous and the most terrible; treacherous because it so often begins as a slight sore throat, of which the child may make no complaint; terrible because within two or three days a previously healthy child may be struggling for its life against a blocking of its air passages, or the absorption of a deadly poison, or against both at the same time.

The Seriousness of a Sore Throat.

It is so easy to make mistakes at the beginning of the illness. Diphtheria may be very difficult to distinguish from other forms of sore throat, and diphtheritic croup may be exactly similar to simple croup, except that it lasts longer and, if untreated, is almost surely fatal. If a child has a sore throat, that throat must be carefully examined by a doctor, and if an attack of croup in the night does not disappear in the morning a doctor must be sent for. Of course, some children are subject to attacks of simple croup, but this does not give any assurance that they may not be attacked by diphtheritic croup. Many children have attacks of other kinds of sore throat, so like diphtheria that it needs an expert to distinguish them, and even the expert may be in doubt, and may for safety treat the disease as diphtheria, without being certain as to its nature.

The Cause and Cure.

Science has discovered the cause of the disease to be a living organism—the diphtheria bacillus. The bacillus can be easily grown on jellies and in broths, and as it grows there it secretes its poison or toxin just as it does in a child's throat. When this toxin enters the living body, the body cells react by secreting an antidote or antitoxin. If sufficient antitoxin is formed soon enough, the child recovers, if not, it dies. Too often the antitoxin formed is insufficient, and the child is overwhelmed by the poison; or the membrane formed on the throat owing to the irritation of the toxin spreads into the air passages and the child is choked. By injecting gradually increasing doses of anatoxin (we will explain this word presently) under the skin of a horse, this animal, while remaining in good health, secretes so much antitoxin, that a small quantity of its serum injected under the skin of a sick child, before it is too late, will neutralise the toxin and save the child's life. If every case of diphtheria were recognised within the first two days, and the remedy used promptly, deaths would be extremely few. Unfortunately, the disease will never be always recognised within the first two days, and with each additional day the death rate rises. Antitoxin has greatly reduced the death rate from diphtheria in Queensland, but there are still many deaths. Although the deaths from diphtheria are less numerous, the number of cases of diphtheria are no less, indeed, they may be more numerous. Antitoxin will save the individual patient, it does nothing to prevent the epidemic. We have saved many lives, but we have failed to prevent diphtheria.

It was hoped that by swabbing the throats of all contacts with diphtheria cases, examining the swabs for diphtheria bacilli, and isolating all carriers as well as patients until three negative swabs at forty-eight hours intervals have been obtained, epidemics might be prevented. This policy may have done some good, but after a fair trial it may fairly be said to have failed to prevent the disease. The reasons are simple. As a matter of practice it is impossible to get hold of all diphtheria carriers, and even thirty "negative swabs" would not be conclusive evidence of the absence of diphtheria bacilli. Furthermore, a large proportion of

the bacilli so discovered are not virulent, and to test all the samples of virulence is scarcely practicable. If all children were trained to keep their fingers out of their mouths and away from their noses, there would be less diphtheria. But such a result would entail many years, or several generations, of education, and even then no absolute safety would be secured.

Our Search for Safety.

In our search for safety we must study the natural history of the disease. If an exceedingly minute quantity of diphtheria toxin be injected into the skin a small area of inflammation follows in those who are susceptible to diphtheria, but no inflammation follows in those who are immune. This is known as the Schick test. In young infants the proportion that react to the test is small. Most of them have derived some antitoxin from their mother's blood, and perhaps some from their mother's milk. From one to three years of age all react—they are all susceptible. Each year after that the percentage that reacts becomes smaller, and after fourteen years it is again low. Between three and fourteen years almost all children have absorbed some diphtheria poison, and most of them become gradually immunised. But in a proportion of these children either from great natural susceptibility, or a massive dose of infection, or a temporary weakening of resistance from a "cold," a tonsilitis, or other infection, there results an acute and dangerous illness. Of recent years we have been able to immunise susceptible, that is "Schick-positive" children. By a simple chemical process diphtheria toxin can be made harmless, without losing its protective power. After two injections of this "anatoxin," as it is called, about 90 per cent. of susceptible children have been made immune, after three injections 98 or 99 per cent.

Prevention of Diphtheria.

It is now possible to prevent diphtheria. It can be prevented at any age. During the first year of life preventive inoculation is under ordinary circumstances hardly necessary. From two to five years of age the death rate from diphtheria is highest and, consequently, the best time for immunisation is during the second and third years. But many children remain susceptible during school age, as indicated by the "Schick test," and for them also immunisation is advisable. Parents will naturally and rightfully inquire—

(1) Is it safe?

(2) What degree of protection will it give?

As to (1), we may say that over half a million children have been immunised, and that accidents have been extremely rare. With our newest methods no serious accidents have occurred. Those that have occurred have been profoundly sad, but in each case the cause of the accident has been discovered, and that it should occur again is nearly impossible. Our methods have much improved. As to (2), we must answer that the protection does not appear immediately, but that it is acquired to some extent within fifteen days of the first injection. The protective value of one injection is, however, insufficient. After three injections the protection given is very great, though not absolute. We have good evidence that it lasts for four years, probably it lasts from six to ten years. It should reasonably be expected to protect children throughout the susceptible period under ordinary conditions.

THE WOMAN ON THE LAND.

By F. O. BOSWORTH, B.A., Queensland Agricultural High School and College.*

DOMESTIC AMENITIES.

IN recent years much attention has been directed to the importance of hygiene in rural industry. By legislation and otherwise progress is being steadily made in the provision of healthy conditions for both man and beast. To the farmer regulations are sometimes irksome at first, but later he recognises their benefits and wonders how he carried on without the improvements effected under them. Probably there is no more conservative class in the community than the farmer. This is not to be wondered at, for his work is by nature a more or less regular routine. Ploughing, harrowing, planting, cultivating, garnering, milking, separating, cleaning utensils, cutting fodder, milking again and so on in the eternal round, follow one another as certainly as night follows day. His work is ordained for him and that done he retires to his downy couch without thought of alteration either in

* In a Radio Address through 4QG.

routine or crop. He wakes up one day to the fact that repairs are needed on some of his buildings—he wants new implements, in fact everything outside the house seems to have conspired to irritate him. The house alone seems to need nothing. His patient wife appears tired at night, but she has done so for years. The kitchen is still hot and on washing days the clothes hang on the line as usual. Everything seems all right and the wife carries on under conditions that would not be tolerated for five minutes by hired labour. "Keeping house" in the country is made one of the worst of jobs, when it should be, viewed in the right spirit, one of the best. Living on the land seems to engender with some people a domestic indifference that is fatal to all refinement and crushes out that vigorous womanliness that was so noticeable when the bride first crossed the threshold. Now, need this be? Are we bound to suppress all culture and refinement in the country? To these questions we, of course, give an emphatic "No."

Much may be done to lighten the burden of manual labour. Progress in civilisation may be judged by the amount of reduction in manual work. To what extent, it may be asked, has the actual manual labour of the farmer's wife been reduced during the last twenty years?

Comfort in the Kitchen.

Factories in which men and women work for eight hours a day at the maximum must satisfy stringent building regulations, and the equipment must be of a high standard. If the work can be accomplished by sitting down, then suitable chairs or stools must be provided. If the work is performed standing up then the height of the table is regulated to the least tiring position. When it comes to the house these provisions are often entirely neglected and no thought whatever is given to making the housewife's working conditions equally favourable. Compare them—eight hours a day in a factory under good conditions, with rest rooms and so forth, and sixteen hours a day in a house, the greater part of the time spent in an ill-equipped kitchen!

However, under the influence of organisations like the Country Women's Association and the Town and Country Women's Club, we are awakening to a fuller realisation of the situation. The general trend of their activities is towards improving the working conditions of the woman on the land, and the general social amenities of country life.

In Queensland, the climatic conditions call for large, well ventilated rooms so that the detached kitchen and living room combined seems to be the ideal arrangement. The advantages to be gained by this arrangement are:—

(1) Provision can be made for windows and doors on both sides to permit of cross ventilation.

(2) The housewife's movements are minimised when preparing meals.

(3) One room only needs cleaning up after each meal.

(4) The increased size of the room means a greater degree of coolness.

If preferred, the kitchen may be smaller with an alcove for dining. Equipment in the kitchen should be grouped to avoid unnecessary work. One square foot of glass area to five or six square feet of floor space in the kitchen will give ample light. The windows should be placed so as to allow of cross ventilation when open. Two small windows, capable of opening, one or either side of the stove recess will be found of great convenience, for they not only shed light in the darkness, but will carry off many of the fumes associated with cooking.

Too frequently our kitchens are mere shells. The outside wall whether of wood or iron forms the inside wall of the kitchen while the rough studs, rafters, and roof remain uncovered, forming a harbour for insect pests and dust. A lining on the inside adds to the attractiveness of the room, facilitates cleaning, and provides a desirable insulating air space and a cooler kitchen. A piece of concave moulding at the junction of the floor and wall and under which the linoleum can just pass will cut off corners in which dirt and dust usually accumulates.

Work is pleasant or unpleasant according to the mental attitude towards it, and the housewife will feel more contented and less tired if she works in a kitchen attractively painted and capable of being kept clean. The Americans have carried the equipment of kitchens to a fine art. They believe in plenty of cupboard space. Usually these cupboards are built into the walls, but it is doubtful if this arrangement would be satisfactory in Queensland owing to the possible invasion of ants and cockroaches which find harbourage in obscure corners and inaccessible grooves. Rags soaked in a solution of mercuric chloride and tied round the legs of dressers

and safes will keep out ants. One soaking will serve for three months. This solution is poisonous, so every care must be taken in its use. Cockroaches will eat almost anything. To get rid of them, a saucer containing dry plaster of Paris and another containing water is usually effective. The pest eat the plaster, becomes dry, then drinks the water and dies. Sodium fluoride sprinkled round their haunts will also rid the house of them. That is by way of digression.

To return to the kitchen equipment: Every kitchen should be provided with a sink, with running water and a suitable means of carrying away waste water. It is believed that this will be found the greatest labour saver among all the single pieces of equipment. When the sink has drain boards or work shelves on either side its usefulness is further increased. To get this convenience the house supply would, of course, have to be placed on high blocks. Experience will show whether it is necessary to have two tanks or one to supply kitchen needs. The carrying of all water up high steps is a wearying job, and no woman should be expected to do it, especially when we consider that a gallon of water weighs ten pounds. The enormous saving of time and energy by having a water tap inside the kitchen can readily be calculated.

The correct height for a working surface will depend upon the height of the worker and the nature of the work. A working surface with a height equal to one-half the worker's height is good for practically any kind of kitchen work. Constant bending down to a low height may in the long run result in serious physical disabilities. This is a matter, the importance of which has not yet been generally realised. When we consider that our housewives are also the mothers of future Australians we can realise that everything should be done to ensure the proper functioning of all here physical processes.

Household Pests.

In many parts of the country summer brings with it a plague of flies. It is to the kitchen that these disease carriers resort. Food has an attraction for them and once they get into the house they are not only an irritant to human beings, but are filthy in the extreme. Provision should be made to put all kitchen utensils behind closed doors. Glass doors on the dresser are preferable to wood, as the light prevents insects such as silverfish and cockroaches from staying there long. Where flies are bad, fly screens inexpensively made, should be placed over all open spaces and so provide a fly-proof kitchen. Working under such conditions is more congenial, irritation is reduced, health will not be affected, and the kitchen will be much cleaner.

This kitchen problem seems to be a tall order, but the health and comfort of the housewife is the first consideration, for upon her efficiency depends the efficiency of the rest of the household.

The Bathroom and the Laundry.

How many farms are there equipped with a bathroom and a laundry? Speak to the farmer about such things and he will tell you that he cannot afford the water. It would be more strictly true to say that sufficient rain falls, but that insufficient storage capacity is provided. In the wet season tanks frequently overflow and the water thus lost would more than provide for all laundry and bathing purposes. Here again the tanks must be perched on high blocks to provide the necessary fall. One finds often that the washing is done out in the sun; all water has to be lifted into the tubs and then the tubs emptied afterwards. All this labour could be obviated by a tank on high blocks fitted with a pipe and a tap over each tub. Where the house is on high blocks a laundry can be fitted up underneath. Concrete tubs set on to a bench of convenient height, with a waste water-pipe, saves a tremendous amount of unnecessary heavy manual toil; the cost of such convenience is comparatively small. As for the boiling arrangements, kerosene tins may serve, but a closed fire under a proper copper, situated close to the washing tubs, is much more economical on wood and human labour. Even if we eliminate the concrete tubs and have the tap over a bench of convenient height we shall eliminate much useless drudgery.

The enamel basin or half kerosene tin under the tap of the tank may be useful for cleansing the face and hands, but no person can be healthy without a regular bath. A small enclosure with a concrete floor can be made under the house and a length of piping from the tank will provide all that is necessary for bodily cleanliness—hence no more upsetting of other rooms, no more carrying of water and all the mess confined to one spot—less cleaning up, less work, more comfort and greater peace of mind.

When one considers the advantages and the low initial cost with which these necessites can be carried out by a handy man, the wonder is that people put up with primitive arrangements so long. A farmer who employs labour is compelled by law to provide these necessary conveniences, and yet they are not regarded as necessaries for his own household.

If the house were the limit of woman's activities her lot could be made reasonably happy, but when she has to take her turn in the dairy, manage the poultry, look after the kitchen garden and, perhaps, help in the field, we can understand why there is a disinclination for farmer's daughters to remain on the land. Anything that can be done to improve her conditions of life will do much to compensate for, possibly, the lack of other amenities. Love in a cottage may last, but it is doubtful if it will withstand many years of rude shocks and jars.

THE OCCURRENCE OF CANCER.

HOW ITS INCIDENCE CAN BE REDUCED.

Among the uses to which wireless telephony is put is the broadcasting throughout a nation or continent information of value alike to the individual or the community, irrespective of time or distance. "Public education," declared a leading medical authority at a recently held meeting at Brisbane of the Town and Country Women's Club, "in essential cancer facts, coupled with periodic medical examination, will go a long way towards reducing the incidence of cancer and the death rate from the disease." This informative address was broadcast throughout the State simultaneously with its delivery.

The term "cancer," said this medical authority, was synonymous with malignancy and connected a group of diseases characterised by the apparently causeless but progressive and persistent growth of the cells of a particular tissue in the human body. The doctor also adverted to the mystery surrounding the origin of the disease in any of its manifold forms, emphasising the fact that every cancer—and there were dozens of varieties—originally sprang from what was a normal cell or group of cells in the human body. Cancer in its first manifestation seemed to have its origin in a distorted type of growth assumed by a cell, or possibly a group of neighbouring cells, in an area which had been subjected for a longer or shorter period to some form of chronic irritation. In most cases the cells took on an abnormal tissue growth, which multiplied rapidly and formed the tumour mass.

The lecturer then explained that this tumour in its early stages was a purely local condition, but sooner or later, depending on its site, type, and rate of growth, cells broke away from the parent body, and, travelling by the blood and lymphatic vessels, were transported to distant organs, where they in turn multiplied and formed secondary growths, in the brain, lungs, spine and liver, for instance. It was usually from the inroads of those growths that the victims died. This served to show, the lecturer urged, the necessity for treating cancer in its local stage.

Giving instances of types of cancer, the lecturer said that certain types were associated with certain occupations, and were thus known as occupational or industrial cancer. For instance, there was a malignancy that affected the hands and forearms of cotton spinners using a certain type of lubricating oil on spinning machines.

He urged the necessity of submitting to an examination by a competent medical authority at the first indication of a suspicious growth, or even a superficial irritation which seems to be permanently established.

"Unfortunately," the lecturer went on to say, "the majority of patients, whether through fear or ignorance, or both, avoided seeing their doctors until the disease had become so widespread that a permanent cure was out of the question."

Throughout the civilised world investigation is continuously and persistently going on as to the origin and incidence of this dread disease. Until a few years ago the only treatment available was the removal of the tumourous growth by the surgeon's scalpel. Now, however, as the outcome of the unceasing physical research carried out the world over by doctors and surgeons we are able to call in the assistance of radium and the deep X-ray, which is to-day available in Brisbane and in other big cities of the State, and it is gratifying to know that these weapons against cancer will ultimately be installed in every public hospital of Queensland, and indeed

throughout the Commonwealth. But after all it is only by a campaign of public education that the disease will be mastered, and the fact must be persistently and continuously emphasised that if a cure is to be effected scientific treatment must be resorted to at the earlier stages of the disease.

TOPICAL NOTES.

Farm Life.

A Singleton (N.S.W.) farmer, Mr. Harry Wright, in the course of a paper read by him at the annual conference of his district Agricultural Bureau, had this to say on the necessity of making farm life profitable and happy:—Farming conducted on the right lines was the most independent and happy life that could be selected, and a mixed farm could be started in a small way without much capital, provided plenty of will power, common sense, and energy were put into the job. The working together of the members of the family put the farmer in a better position than any other tradesman.

Dairying, Mr. Wright considered a safe occupation to follow as a basis on which to build a mixed farm. Choice of suitable land, of good types of cattle, and the adoption of good business methods were stressed as essential to success, while a comfortable home with pleasant surroundings was important. Pig-raising was a good adjunct to dairying, but the farmer should ensure that he raised attractive pigs of the type desired by buyers. Poultry, fruit, bees, and vegetables were also good sidelines.

The adoption of up-to-date methods was important, and farmers and their families should join up with the Agricultural Bureau for educational, economic, and social benefits. Junior farmers' clubs to help in the scientific training of youths on the land should be encouraged. It was necessary to instil into the boys what a healthy and happy life the man on the land leads as the creator of new wealth.

In conclusion, Mr. Wright stressed the duty of parents in relation to keeping their children on the farms, by making their lives not only attractive but profitable.

The Medicine Chest.

Every home should have a measuring glass for medicines, so that the inmates shall not have to rely on teaspoons and tablespoons for measuring purposes.

The best "safety first" maxims are those concerning the medicines chest. Every mother should read the following suggestions:—

Keep all medicines together in one cupboard.

Never take medicine in the dark.

Always look at the label and read the directions before taking a dose of medicine.

Never increase the dose, or take it more frequently without consulting your physician if it is taken under his orders.

Pour from the bottle with the label upward. This keeps the label clean and legible.

Never take prescription medicine originally intended for others; the drugs it contains may be entirely unsuited for your condition, and be actually harmful.

Capsules, pills, and tablets should always be taken with a few swallows of water, unless otherwise directed by your physician.

Keep medicine out of reach of children; keep the cupboard locked, if possible.

Keep capsules, pills, and tablets in a dry place—moisture may spoil them.

Always keep medicine bottles, boxes, jars, or tubes tightly corked, or with the tops securely on.

Keep ointments and salves securely closed, and in a cool place.

Never interchange tops or covers on pill or powder boxes if they bear directions regarding use. Dangerous results may occur.

After using an eye water in an eye cup, do not pour it back into the bottle, as this is apt to contaminate the preparation.

MANURE FOR CABBAGES.

To grow cabbages well plenty of manure should be used. There is no manure to which this crop responds so well as animal. For heavy lands horse manure, and for light soils cow or pig are respectively the best when they can be obtained. If the soil is of a poor quality, dig the ground two spits deep, and put a good layer of manure between the two spits. This is especially necessary in the case of autumn or summer crops, which have to stand a dry spell. Spring cabbage—that is, those that are planted in the autumn for use in the spring—do well if planted on ground that has been well worked and manured previously for peas or onions, and on such ground cabbages can be planted without any fresh manure being added. Of other manures lime is an important factor in successful cabbage culture; it is chemically and mechanically beneficial to the soil, and the cabbage tuber. It should be applied at the rate of about 2 lb. to the square yard, and is particularly necessary to heavy soils and those rich in humus. Superphosphate at the rate of 2 oz. to the square yard is good, but should not be applied at the same time as lime or to soils that are infected with club root. When the crop is nicely established, apply 1 oz. of sulphate of ammonia to heavy, damp land, or 1 oz. of nitrate of soda per square yard in the case of light or sandy soil. Nitrate of soda is a splendid fertiliser for the cabbage family. When especially fine heads are required, water the plants once or twice during the growing season with the following mixture:—1 oz. of iron sulphate and 2 oz. of sulphate of ammonia dissolved in 1 gallon of water.

KITCHEN GARDEN.

Now is the time when the kitchen garden will richly repay all the labour bestowed upon it, for it is the month for sowing many kinds of vegetables. If the soil is not naturally rich, make it so by a liberal application of stable manure and compost. Manure for the garden during summer should be in the liquid form for preference. Failing a sufficient supply of this, artificials may be used with good results. Dig or plough the ground deeply, and afterwards keep the surface in good tilth about the crops. Water early in the morning or late in the evening, and in the latter case stir the soil early next day to prevent caking. Mulching with straw, leaves, or litter will be a great benefit as the season becomes hotter. It is a good thing to apply a little salt to newly-dug beds. What the action of salt is is not exactly known, but when it is applied as a top dressing it tends to check rank growth. A little is excellent for cabbages, and especially for asparagus, but too much renders the soil sterile and causes hardpan to form. French or kidney beans may now be sown in all parts of the State. The Lima bean delights in the hottest weather. Sow the dwarf kinds in drills 3 ft. apart and 18 in. between the plants, and the climbing sorts 6 ft. each way. Sow Guada beans, providing a trellis for them to climb on later. Sow cucumbers, melons, marrows, and squash at once. If they are troubled by the red beetle, spray with Paris green or London purple. In cool districts peas and even some beetroot may be sown. Set out egg plants in rows 4 ft. apart. Plant out tomatoes 3½ ft. each way, and train them to a single stem, either on stakes, trellis, or wire netting. Plant out rosellas. Sow mustard and cress, spinnach, lettuce, vegetable marrows, custard marrows, parsnips, carrots, chicory, eschalots, cabbage, radishes, kohl-rabi, &c. These will all prove satisfactory provided the ground is well worked, kept clean, and that water, manure, and, where required, shade are provided.

FIVE REASONS IN FAVOUR OF THE HOME VEGETABLE GARDEN.

(1) Fresh vegetables, especially vegetables containing vitamines, are essential to good, robust health, and medical men are now advising people to "eat more vegetables."

(2) The growing of vegetables not only means a saving of money, but educates the children by inculcating a desire to have their own gardens in later life, and so help to keep down the costs of living.

(3) Vegetable-growing is not only a healthy occupation, but it also provides exercise and recreation. In the suburbs it has a tendency to keep young people contented at home, and to trouble less about going to horse races and places of gambling. With country people who, perhaps, are less in need of exercise, gardening is a delightful hobby.

(4) It enables private gardeners to improve the strains of vegetables by a careful selection of seed, much in the same way that a flockmaster improves his sheep; and much satisfaction, and not unusually generous reward are to be gained from this work.

(5) The home garden enables the testing out, in a small way, of the newer varieties of vegetables, which work is not always possible, or, if it is possible, not payable with the professional or commercial gardener. The amateur gardener will find this work both fascinating and health-giving.

Farm Notes for September.

With the advent of spring, cultivating implements play an important part in farming operations.

The increased warmth of soil and atmosphere is conducive to the growth of weeds of all kinds, particularly on those soils that have only received an indifferent preparation.

Potatoes planted during last month will have made their appearance above the soil, and where doubt exists as to their freedom from blight they should be sprayed with either Burgundy or Bordeaux mixture as soon as the young leaves are clear of the soil surface.

Land which has received careful initial cultivation and has a sufficiency of sub-surface moisture to permit of a satisfactory germination of seeds may be sown with maize, millets, panicum, sorghums, melons, pumpkins, cowpeas, broom millets, and crops of a like nature, provided, of course, that the areas sown are not usually subjected to late frosts.

Rhodes grass may be sown now over well-prepared surfaces of recently cleared forest lands or where early scrub burns have been obtained, and the seed is sown subsequent to showers. More rapid growths, however, are usually obtainable on areas dealt with, say, a month later.

In connection with the sowing of Rhodes grass, farmers are reminded that they have the Pure Seeds Act for their protection, and in Rhodes grass, perhaps more than any other grass, it is necessary that seed of good germination only should be sown. A sample forwarded to the Department of Agriculture will elicit the information free of cost as to whether it is worth sowing or not.

Where the conditions of rainfall are suited to its growth, paspalum may be sown this month.

The spring maize crop, always a risky one, requires to be sown on land which has received good initial cultivation and has reserves of soil moisture. Check-row seeding in this crop is to be recommended, permitting as it does right-angled and diagonal cultivation by horse implements, minimising the amount of weed growth, and at the same time obtaining a soil mulch that will, with the aid of light showers, assist to tide the plant over its critical period of "tasselling."

Although cotton may be sown this month, it usually stands a better chance if deferred until October. The harvesting of cotton during the normal rainy season is, if possible, to be avoided.

The sowing of intermediate crops prior to the preparation of land for lucerne sowing should be carried out in order that early and thorough cultivation can take place prior to the autumn sowing.

The following subsidiary crops may be sown during the month:—Tobacco and peanuts; plant sweet potatoes, arrowroot, sugar-cane, and cow cane (preferably the 90-stalked variety), and in those districts suited to their production yams and ginger. Plant out coffee.

THE FARM GARDEN

It is not necessary to discuss whether the vegetable garden or the flower garden is the more valuable; we ought to take it for granted that both are essential to the complete country home. Fresh, succulent vegetables, full of vigorous vitamins, and appetising with a thousand precious ethers, make the farm table something that city folk can barely imagine.

Yet man shall not live by bread alone, and if we need vegetables for our bodies we equally need flowers for our souls—for that aesthetic hunger for the beautiful that is inherent in all of us.

Vegetable-growing is usually the task of those members of the farm household whose ordinary occupation is not laborious, muscle-straining work on the farm; and to them it represents exercises, recreation, stimulation of the bodily functions, and health.

For the younger members of the family vegetable-growing provides education in soil science, in cultural lore, in the elements of breeding, as well as in those qualities of the mind that are stiffened by adversity and nourished by success. There are pests to fight, frosts to guard against, air and water to put into the soil, and all the processes of nature to assist.

And vegetable eating is the cure for many disorders, and the proved preserver of health. Furthermore, the vegetable garden is the soil in which the herb "thrift" thrives most vigorously. A productive vegetable patch shrinks the store bill, and doctors' and chemists' bills. It does ever so much more—it trains the young people in ways of health and ways of thrift, in which they will walk all their lives. Every farm should have both a vegetable and a flower garden book, to be able to supplement all the family knowledge of gardening, and as a reminder of what to sow and when to sow it.

Economists tell us that the fault of Australian agriculture is that it tends too much to specialise in one crop or other product, and thus the farmer is up against it when prices of his staple are low. There are sidelines that the farmer with spare labour and spare capital might wisely take up; but there is one sideline that calls for practically no capital, and for only spare-hour labour—the vegetable garden. And though vegetables may not bring much hard cash on to the farm, they will prevent a fairly considerable sum from going out.

Some farmers are rather contemptuous about vegetable gardening. Let such a one agree to fence, plough, and manure a quarter of an acre and pass it over to mother and the girls to make what they can of it. Let him agree to purchase all the vegetables needed for the farm table at current rates, and to market the surplus for his women-folk.—"The Country Woman."

Orchard Notes for September.

THE COASTAL DISTRICTS.

September is a busy month for the fruitgrowers in the coastal districts of this State, as the returns to be obtained from the orchards, vineyards, and plantations depend very largely on the trees, vines, and other fruits getting a good start now.

In the case of citrus orchards—especially in the southern half of the State—it is certainly the most important month in the year, as the crop of fruit to be harvested during the following autumn and winter depends not only on the trees blossoming well but, what is of much more importance, that the blossoms mature properly and set a good crop of fruit.

This can only be brought about by keeping the trees healthy and in vigorous growth, as, if the trees are not in this condition, they do not possess the necessary strength to set their fruit, even though they may blossom profusely. The maintenance of the trees in a state of vigorous growth demands—first, that there is an adequate supply of moisture in the soil for the requirements of the trees; and, secondly, that there is an adequate supply of the essential plant-foods available in the soil.

With respect to the supply of moisture in the soil, this can only be secured by systematic cultivation, except in seasons of good rainfall or where there is a supply of water for irrigation. As a rule, September is a more or less dry month, and when it is dry there is little chance of securing a good crop of fruit from a neglected orchard.

If the advice that was given in the Notes for August regarding the conservation of moisture in the soil has been carried out, all that is necessary is to keep the soil stirred frequently, so as to prevent the loss of moisture by surface evaporation. If the advice has been ignored, then no time should be lost, but the soil should be brought into a state of good tilth as quickly as possible.

Where there is a supply of water available for irrigation, the trees should receive a thorough soaking if they require it. Don't wait till the trees show signs of distress, but see that they are supplied with an adequate supply of moisture during the flowering and setting periods.

It is probable that one of the chief causes why navel oranges are frequently shy bearers in the coastal districts is that the trees, though they produce a heavy crop of blossoms, are unable to set their fruit, owing to a lack of sufficient moisture in the soil at that time, as during seasons when there is a good rainfall and the trees are in vigorous growth, or where they are grown by irrigation, as a rule they bear much better crops. The importance of maintaining a good supply of moisture in the soil is thus recognised in the case of this particular variety of citrus fruit.

When the trees show the want of sufficient plant-food—a condition that is easily known by the colour of the foliage and their weakly growth—the orchard should be manured with a quick-acting, complete manure, such as a mixture of superphosphate, sulphate of ammonia, and sulphate of potash, the plant-foods which are soluble in the water contained in the soil and are thus readily taken up by the feeding roots.

Although the above has been written mainly in respect to citrus orchards, it applies equally well to those in which other fruit trees are grown. Where the land has been prepared for bananas, planting should take place during the month. If the plantation is to be made on old land, then the soil should have been deeply ploughed and subsoiled and brought into a state of perfect tilth prior to planting. It should also receive a good dressing of a complete manure, so as to provide an ample supply of available plant-food. In the case of new land, which has, as a rule, been scrub that has been recently fallen and burnt off, the first operation is to dig the holes for the suckers at about 12 ft. apart each way. Good holes should be dug, and they should be deep enough to permit the top of the bulb or corm of the sucker to be 6 in. below the surface of the ground.

Care should be exercised in the selection of suckers, butts, or bits. Either of the two latter are preferable, and in the case of suckers which have broken into leaf, these should also be cut hard down to the butt. Before planting all roots should be cut off closely and the surface pared or scraped, excepting over the buds or eyes which are allowed for development. Where the butts are split into sections (up to four) according to the number and placements of eyes, these are planted with the eye or eyes facing downwards. In the case of butts, 2 to 3 eyes are left spaced around the butt, any surplus ones being removed. The top having previously been cut down to the corm and the centre scored out. Better growth is evidenced in each case, and as no cut surface is made available (each ''plant'' being covered by a few inches of soil immediately) beetle borer infestation is not shown.

In old banana plantations keep the ground well worked and free from weeds and remove all superfluous suckers; also all bases of plants which have fruited.

When necessary manure—using a complete fertiliser rich in potash, nitrogen, and phosphoric acid, such as a mixture of meatworks manure and sulphate of potash —2 of the former to 1 of the latter.

Pineapples can also be planted now. The ground should be thoroughly prepared —viz., brought into a state of perfect tilth to a depth of at least 1 ft.—more if possible—not scratched, as frequently happens; and when the soil requires feeding, it should be manured with a complete manure, which should, however, contain no superphosphate, bonedust or Nauru phosphate being preferable.

Old plantations should be kept in a good state of tilth and be manured with a complete fertiliser in which the phosphoric acid is in the form of bonedust, basic phosphate, or finely ground phosphatic rock, but on no account as superphosphate.

The pruning of custard apples should be carried out during the month, leaving the work, however, as late in the season as possible, as it is not advisable to encourage an early growth, which often means a production of infertile flowers. If the weather conditions are favourable passion vines can also be pruned now, as if cut back hard they will make new growth that will bear an autumn crop of fruit instead of one ripening during the summer.

Grape vines will require careful attention from the time the buds start, and they should be regularly and systematically sprayed with Bordeaux mixture from then till the time the fruit is ready to colour, in order to prevent loss by downy mildew or anthracnose. Sulphuring may be required against powdery mildew.

Where leaf-eating beetles, caterpillars, or other insects are present, the trees or plants on which they are feeding should be sprayed with arsenate of lead. All fruit-fly infested fruit must be gathered and destroyed and on no account be allowed to lie about on the ground, as, if the fly is allowed to breed unchecked at this time of the year, there is very little chance of keeping it in check later in the season.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

Where not already completed, the winter spraying with lime-sulphur should be finished as early in the month as possible. Black aphis should be fought wherever it makes its appearance by spraying with a tobacco wash, such as black-leaf forty, as if these very destructive insects are kept well in hand the young growth of flowers, leaves, wood, and fruit will have a chance to develop.

The working over of undesirable varieties of fruit trees can be continued. The pruning of grape vines should be done during the month, delaying the work as long as it is safe to do so, as the later the vines are pruned the less chance there is of their young growth being killed by late frosts. Keep the orchards well worked and free from weeds of all kinds, as the latter not only deplete the soil of moisture but also act as a harbour for many serious pests, such as the Rutherglen bug.

New vineyards can be set out, and, in order to destroy any fungus spores that may be attached to the cuttings, it is a good plan to dip them in Bordeaux mixture before planting. The land for vines should be well and deeply worked, and the cutting should be planted with one eye only out of the ground and one eye at or near the surface of the ground.

In the warmer parts which are suitable for the growth of citrus fruits, the land must be kept well cultivated, and if the trees need irrigating they should be given a good soaking, to be followed by cultivation as soon as the land will carry a horse without packing.

In these parts fruit fly should be systematically fought, as it will probably make its appearance in late citrus fruits and loquats; and if this crop of flies is destroyed, there will be every chance of the early crops of plums, peaches, and apricots escaping without much loss.

SUBSCRIPTIONS TO THE JOURNAL.

Subscribers are reminded that when a cross is placed in the square on the first page of the Journal it is an indication that the term of their subscription ends with the number so marked, and that it is advisable to renew immediately if they desire the retention of their names on our mailing list.

To farmers, graziers, horticulturists, and Schools of Art the annual subscription—one shilling—is merely nominal, and the charge is only imposed to cover the cost of postage. To them, otherwise, it is an absolutely free issue. Members of agricultural and similar societies who are not actively engaged in land pursuits are asked to pay five shillings a year, while the annual subscription charged to the general public is ten shillings.

Farmers particularly are urged to keep their names on our mailing list, for through the Journal they may keep themselves well informed in respect to the activities of the Department, and other matters with which they are directly concerned. Instead of sending just the annual subscription along it is suggested that, when renewing it, they do so for a longer term. For instance, five shillings would keep their names on our subscribers' register for five years. By doing this they would obviously help to reduce clerical labour as well as avoid the inconvenience to themselves of posting annually the very small sum necessary to keep their names on our mailing list.

On another page an order form may be found, and for those whose annual subscription is about due what is wrong with filling it up now and posting it direct to the Under Secretary, Department of Agriculture and Stock?

ASTRONOMICAL DATA FOR QUEENSLAND.

Times Computed by D. EGLINTON, F.R.A.S., and A. C. EGLINTON.

TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

	August, 1930.		September, 1930.		MOONRISE. Aug., 1930.	MOONRISE. Sept., 1930.
Date.	Rises.	Sets.	Rises.	Sets.	Rises.	Rises.
1	6.37	5.19	6.10	5.34	a.m. 10.50	a.m. 11.29
2	6.36	5.20	6.9	5.34	11.25	p.m. 12.21
3	6.36	5.20	6 8	5.35	12.0	1.14
4	6 35	5.21	6.7	5.35	p.m. 12.43	2.8
5	6 34	5.22	6.6	5.36	1.33	3.5
6	6.33	5.23	6.5	5.36	2.25	4.0
7	6.33	5.23	6.4	5.37	3.19	4.53
8	6.32	5.24	6.3	5.37	4.13	5.47
9	6.31	5.24	6.2	5.38	5 8	6.39
10	6.30	5.25	6.0	5.38	6.4	7.31
11	6.29	5.25	5.59	5.39	6.52	8.25
12	6.29	5.26	5.58	5.39	7.50	9.21
13	6.28	5.26	5.56	5.40	8.42	10.22
14	6.28	5.27	5.55	5.40	9.34	11.23
15	6.26	5.27	5.54	5.41	10.27	...
16	6.25	5.28	5.53	5.41	11.27	a.m. 12.25
17	6.24	5.28	5.52	5.42	...	1.27
18	6.23	5.29	5 51	5.42	a.m. 12.27	2.28
19	6.22	5.29	5.50	5.43	1.31	3.24
20	6.21	5.30	5.48	5.43	2.34	4.12
21	6.20	5.30	5.47	5.43	3.39	4.53
22	6.19	5.31	5.46	5.43	4.41	5.30
23	6.18	5.31	5.45	5.44	5.35	6.9
24	6.17	5.32	5.44	5.44	6.21	6.40
25	6.16	5.32	5.43	5.45	7.2	7.14
26	6.15	5.32	5.42	5.45	7.36	7.53
27	6.14	5.33	5.40	5.46	8.11	8.34
28	6.13	5.33	5.39	5.46	8.45	9.21
29	6.12	5.33	5.38	5.47	9.19	10.16
30	6.11	5.34	5.37	5.47	9.57	11.7
31	6 10	5.34	...	...	10.40	...

Phases of the Moon, Occultations, &c.

1 Aug.	☾	First Quarter	10 26 p.m.
9 ,,	○	Full Moon	8 58 p.m.
17 ,,	☽	Last Quarter	9 31 p.m.
24 ,,	●	New Moon	1 37 p.m.
30 ,,	☾	First Quarter	9 57 a.m.

As Mercury will be at its greatest distance, 27 degrees, east of the Sun on the 25th, it will be at that distance above the western horizon when the Sun sets. Though the brilliance of its disc will be less than one-half of the maximum amount, it will afford a favourable opportunity for observation when the daylight has sufficiently faded. Venus, being 17 degrees higher up and somewhat to the south, will, of course, be much more noticeable.

On the 27th, the Sun will be slowly passing from west to east of Neptune, but more than half a degree further south, Neptune being about 2,800 million miles beyond it.

Mercury will set at 6·37 p.m. on the 1st and at 7·19 p.m. on the 15th.

Venus will set at 8·31 p.m. on the 1st and at 8·49 p.m. on the 15th.

Mars will rise at 2·46 a.m. on the 1st and at 2·32 a.m. on the 15th.

Jupiter will rise at 4·38 a.m. on the 1st and at 3·55 a.m. on the 15th.

Saturn will rise at 2·50 p.m. and set at 4·32 a.m. on the 1st; on the15th it will rise at 1.52 p.m. and set at 3·27 a.m.

When the Southern Cross comes into view after sunset on the 1st it will be bending downwards, slightly to the right, about 10 degrees west of the southern meridian. At the end of the month it will be much more noticeably inclined, and about 10 degrees further west.

8 Sept.	○	Full Moon	12 47 p.m.
16 ,,	☽	Last Quarter	7 12 a.m.
22 ,,	●	New Moon	9 41 p.m.
30 ,,	☾	First Quarter	12 57 a.m.

Apogee, 6th September, at 7.54 a.m.
Perigee, 21st September, at 2.54 p.m.

Soon after sunset on the 2nd it will be noticeable that the Moon and Saturn will both be very high overhead, the Moon being almost in the zenith at Warwick, and Saturn 6 degrees (the length of the Southern Cross) northward of it. Saturn, which was apparently moving slowly westward amongst the stars of Sagittarius, since the end of April will, like the Sun on 22nd June, seem to stop and retrace its steps, which it will continue to do till the end of the year when it will reach the same position it held about 1st May.

Venus will reach its greatest elongation, 46 degrees east of the Sun, on the 12th. It will remain upon the western horizon until after 9 o'clock, and its brilliance will continue to increase for another month.

Mercury will be passing from east to west between Earth and Sun on the 21st, but a transit will not occur, Mercury passing about 3 degsees south of the Sun.

The Sun will reach the equinoctial point, crossing the celestial equator at 4.36 a.m., on the 24th when there will be 12 hours night and 12 hours day.

For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S., add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhat about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

QUEENSLAND AGRICULTURAL JOURNAL

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Event and Comment.

The Current Issue.

BUOYANCY of spirit and a general air of quiet and firm confidence in Queensland and its future were marked characteristics of the huge daily crowds at the Brisbane Exhibition, and something of that spirit of sane optimism was captured by our camera, as will be seen by our Show report, necessarily condensed, in the current issue. Pictures of the winners in the live stock competitions have been reserved for our October number. Pressure on space has also compelled the holding over of the third instalment of Mr. Currie's paper on The Brown Cut Worm, which will appear in our next issue. Mr. Easterby continues his interesting narrative of the development of the Queensland sugar industry, and the sugar section is otherwise well supplied. Tomato-growing in North Queensland is the subject of a short note by Mr. Duffy. The officers of the Fruit Branch have also contributed a valuable illustrated article on tomato culture, grading, and packing. Mr. Hardy, a well-known Northern horticulturist, contributes a brief account of his fruitgrowing experiences at Herberton. Results of a poultry-feeding test at Mount Gravatt are given, while Coccidiosis in Chickens is dealt with in a well-illustrated article by officers of the Poultry Section. Prospects of tobacco-growing in North Queensland are noted briefly. Plant breeding experiments at the Roma State Farm are described by Mr. Soutter. Mr. Shelton has a useful compilation on pig diseases, illustrated by two excellent black and white drawings by Mr. Helmsing, as well as numerous photographs. The art of rose culture is discussed by Mr. Heers in the Home and Garden Section. Other regular features of this month's Journal are well supplied with a wide diversity of interesting information.

The Royal National Association.

THE story of the Royal National Association was presented in concentrated form at its Fifty-fifth Annual Show at Brisbane last month. Probably no other institution has had a greater influence on the remarkable development of our rural industries, especially in the last twenty years. To what degree its useful purpose to Queensland has been proved can hardly be realised adequately; to what extent it will continue to radiate its influence and how far it will develop its greatness as a factor in the brightening and prospering of country life can be imagined more readily. For is not the Brisbane Show itself extraordinary evidence of the energy, the enterprise, and the vitality of rural industry that it is the Association's job to develop, and upon which rests the soundness and completeness of our existence as a nation? The Association has had the good fortune to have big men at the head of its affairs. It is no wonder, therefore, that it is a fountain of progressive ideas and a strong educational force. And that, no doubt, is the reason why it is never guilty of taking a narrow view nor of pessimism in any of its constrictive or depressing forms. It stands for better farming, better stock, better business, bigger returns to the man on the land, and higher service to the State. The Brisbane Exhibition in its comprehensiveness and completeness was an impressive example of the high standards the Association has set, as well as of the immense value of its national service.

The Brisbane Show—A Great Education.

WHEN asked to give some of his impressions of the Show, His Excellency the Governor, Sir John Goodwin, said that one strong impression was the friendly relations existing between all exhibitors, despite what were termed the hard times for the country. There was a magnificent display. It was the fourth Show he had seen, and on each occasion there had been a big improvement. Sir John was impressed with the advancement shown in the beef and dairy cattle, especially with the high standard of the Hereford and Shorthorn breeds. "The dairy cattle are simply splendid," he added. "I have seen the Illawarras, Jerseys, Guernseys, Ayrshires, and other breeds, and have noticed their superior quality. I observed that both the big breeders and the smaller breeders have carefully selected their animals, and are maintaining a standard of the highest quality."

Speaking of the meat exhibit, His Excellency said he regarded it as one of the highest value in the Show. He could see that the best and most scientific methods were being followed to produce beef of the best quality.

Referring to the district exhibits, the Governor remarked: "I regard them of the utmost importance, and they convey to me an impression that will be always remembered as proof of the greatness of the country." He had yet to have a close look at the fruit and one-farm displays, observing that he had been at the Exhibition every day, but there was so much to observe that all could not be seen in the four days that he had been at the grounds.

"The National Association," continued His Excellency, "is doing valuable work for the whole of the State, and, as the people in the cities have not the opportunity to visit the country except for short periods, the Association is bringing the value of the country under the notice of the cities. There is an immense educational value to the younger generation and to the elder people, who can learn something from every day that a visit is made to the Exhibition, for by daily intercourse there is an interchange of ideas which must be of benefit to the individual and the people of the State generally. I am struck by the friendly spirit amongst all people."

The Council of Agriculture—Organised Marketing.

SPEAKING on the occasion of his unanimous election to the Presidency of the Council of Agriculture, the Minister for Agriculture and Stock, Mr. Harry F. Walker, said that in accepting the position he recognised that it brought greater responsibilities to his s' oulders because of the great amount of work performed by the Council of Agriculture. During the past twelve months he had watched their work as

closely as his time permitted. In his travels he gained much information about the problems they had to face. As a result he had been particularly keen in furthering the interests of the Council.

He looked upon organised marketing as the most satisfactory way of disposing of the surplus products of the State. He had heard it stated that the cost was too great, but those critics would be surprised if they saw actually what the cost was. Under organised marketing there was only one conclusion—that the farmer was better off now than ever in the history of Queensland. Organised marketing started in Queensland, and New South Wales and Victoria had followed suit by forming boards to control products. South Africa was also adopting the system, and in Great Britain a similar movement was on foot.

He as Minister considered that the executive committee and boards were doing good work. He praised their work and that of the secretary of the Council (Mr. C. Sheehy).

During the year he saw the need for the control of the maize crop, and he had decided to convene a conference of those interested to determine the policy of maize-growers. When a pool had been suggested previously there was opposition to its formation. The formation of a pool was of great importance to Queensland. He was also prepared to give consideration to the bacon people who were making an effort to place their industry on a better footing.

Mr. Walker congratulated the primary producers on the success of their year's work, and commended the spirit of co-operation that they had manifested, not only among themselves but with the Government, which viewed their efforts sympathetically and desired to help in every practical way in the solution of their pressing problems.

Room for Rural Expansion.

In the course of a notable speech on the Address in Reply in the State House, the Minister for Agriculture and Stock, Mr. Harry F. Walker, reviewed the whole of the activities of his Department in their relation to the definite progress made by the primary industries during the year. Referring to the room for tremendous expansion that exists in our rural industries, he said:—

> When we speak of increased production we must first aim in the direction of inducing people to go upon the land, and to do so we must make conditions attractive not only for the older members of the community but particularly for the younger people, who have a right to enjoy the ordinary amenities of modern social life. If we have the courage to face realities, then we shall be able to overcome our present difficulties. That end can be achieved only by setting aside party politics for the time being, although I should like to see party politics abolished for all time. We should work with the one common object of saving one of the greatest countries of the world. The prosperity of the State is bound up with the prosperity of the primary producer.
>
> . . . . In Queensland we have wonderful primary industries, from sugar in the North to fruit in the South, varying with climatic conditions possible only in a tropical and sub-tropical country like our own. With these industries in mind, one can only come to the conclusion that there is vast room for the development of these industries, particularly in view of the statements made by hon. members representing rural districts who have fully backed up my opinion in this regard. I am satisfied that we could launch out in many directions as we have never done before.
>
> . . . . . At this stage of our national development I cannot stress too strongly that the wellbeing of the Commonwealth is bound up in agricultural and other rural pursuits. The only sound way to secure continued increase in production is to improve farming methods, to eliminate the hazards of rural enterprise, and to apply the lessons of science to every branch of production. It has been said that every extra bushel of wheat per acre taken from the soil is worth £3,000,000 to Australia. Every insect and vegetable pest we learn to control saves enormous financial loss. Every application of new knowledge to pasture and soil management and animal husbandry means an immense amount of added wealth to the country.

THE QUEENSLAND SUGAR INDUSTRY.

By H. T. EASTERBY, Director, Bureau of Sugar Experiment Stations.

PART IX.

(b) Review of the Industry since Federation.

(Continued.)

IN 1913 the wet season was a particularly heavy one, and caused a number of floods in the sugar districts between Cairns and the Herbert River. The losses in the Innisfail district were severe, and many areas of land on river banks were washed away and a number of buildings destroyed. In some instances large quantities of sand and gravel were washed in from the rivers, causing much loss to canegrowers of valuable land. Floods, too, occurred in parts of the Cairns and Herbert River districts, though the damage was not so great. Floods were also experienced in the Baffle Creek and Bundaberg areas. In spite of these unfortunate happenings the 1913 crop was the largest to that date, amounting to 242,837 tons, the previous record yield being 210,756 tons in 1910.

The introduction of motor tractors began about this period, but they were looked on then as more or less of an experiment. Favourable reports, however, were given of their work, and they commenced to rapidly increase in numbers in the succeeding years.

During this year an effort was made by Messrs. Rankin, Swayne, and Caine, M's.L.A., representing the sugar constituencies, to have a Sugar Cane Price Boards Bill passed. It was not a Government Bill, and as a whole the Government did not support it, though the Opposition did. On the question that the Bill be read a second time, the voting was thirty-one in favour and twenty-eight against. The Bill, however, was not further proceeded with, which created much disappointment to many growers at the time. During the following year (1914) the Macnaughton Award in relation to labour in the cane fields caused commotion, and materially increased the cost of production. This Award and succeeding ones will be referred to in later sections.

Another Act in relation to sugar-mills was passed this year, but it was one that so far has never been made use of. This was an Act to provide for the establishment and management of co-operative sugar-mills. It provided that the Government might lend a sum equal to two-thirds of the capital cost of any sugar-mill to be purchased or built by a co-operative company for a term of twenty-one years bearing interest at 4 per cent. per annum.

At about the time the Act was passed one or two groups of farmers thought of purchasing or establishing sugar-mills, but such schemes never came to fruition. In one case a large milling interest, which considered their cane supply would be interfered with, purchased a lot of the land where it was proposed to run tramlines, and so put a "sprag" in the project, from which it never recovered.

At the end of 1913 the Sugar Experiment Station at Bundaberg was established.

The year 1914 was chiefly noteworthy for the outbreak of the great European War, which was destined to affect the sugar industry in no small degree amongst many larger issues. This subject, however, will

be dealt with in a later article relating to prices for sugar. At present it is sufficient to say that the enlistment of men from the sugar districts was considered to be the highest in Australia, as it has been stated that one in eight of the population enlisted. This amply bore out the Federal Royal Commission's support for the industry from a defence point of view.

The price for sugar was so low in 1914 that in some districts farmers for a time actually went in for a "strike" for an increased rate in the price to be paid for cane. The matter was settled, but it was an indication that farmers expected better treatment. Farmers at that time were faced not only with higher costs of production but with the increase that had been going on in the cost of living and the purchase of farming implements and materials.

It was about this time, too, that the influx of Italians into the industry in parts of North Queensland began to arouse more attention. The sale of a large number of farms in the Ingham district to Southern Europeans was taking place, whose standard of living was below our own at that time.

A most severe drought affected the cane areas in 1915, more particularly those south of Townsville. The Lower Burdekin district was particularly hard hit, especially on the Inkerman side of the river, where there was no irrigation at that time, and where hundreds of acres of cane died right down to the ground. The Inkerman Mill did not crush, and the Pioneer and Kalamia Mills had only small crops. The total yield of sugar for the State was 140,496 tons, compared with 242,837 tons in 1913 and 225,847 tons in 1914, and the shortage in the sugar crop was estimated to be about 114,000 tons compared with the consumption. As in the 1902 drought, written of earlier in this history, large quantities of cane were sold for forage purposes.

Acts affecting the industry passed this year were of a highly important nature. The first was the Sugar Acquisition Act to ratify the compulsory acquisition of raw sugar which had already been proclaimed, and the other the long expected Regulation of Sugar Cane Prices Act. Both of these will be referred to in later articles.

A Royal Commission on a phase of the industry sat during 1915. This was appointed to ascertain whether dissatisfaction existed in connection with the working of Central sugar-mills at Mackay, to suggest remedies for the removal of same, to recommend a method whereby the mills may be worked by suppliers of cane on the co-operative principle, and to make suggestions with reference to the compensation that should be given to merely land-owning shareholders who were not suppliers of cane to the mills. This Commission took evidence in relation to the Plane Creek, Pleystowe, and North Eton Mills. Dissatisfaction did exist at that time, but the subject was one of local interest, and the difficulties that were present then have since apparently been overcome.

The following year (1916) the once famous Dickson Award for sugar-workers created a tremendous stir amongst the millers and growers. The majority of the mills below Townsville closed down by way of protest, and several remained closed for a period of two months, while three did not crush at all. The mills above Townsville, however, did not close, the various managements stating that they were unable to do so.

During this year a Board of Inquiry on the sugar industry was appointed by the Queensland Government. The Board consisted of

W. J. Short (Chairman), M. B. Salisbury, and the writer, and the matters upon which they were to report were as follows:—

(1) The position of the industry in Australia with regard to the possibility of over-production;
(2) The wisdom of establishing additional mills;
(3) In the event of additional mills being recommended, the most suitable localities for same.

As was the case with the 1911 Commission, a number of applications had reached the Government for the erection of more Central mills. These were as under:—

(1) Cooktown;
(2) Bailey Creek, to the north of the Daintree River, between Port Douglas and Cooktown;
(3) Atherton;
(4) Freshwater (Cairns);
(5) Daradgee and South Russell (including the coastal lands lying between the Russell River on the north and the Johnstone River on the south);
(6) Banyan, Hull, and Tully Rivers;
(7) Long Pocket (Herbert River);
(8) Haughton River (29 miles from Townsville, on the North Coast Line);
(9) Silent Grove (Mackay);
(10) Yeppoon (Rockhampton);
(11) Rockhampton;
(12) Alton Downs (Rockhampton);
(13) Jardine (North Coast Railway, 21 miles north of Rockhampton);
(14) Stanwell, Woodend, and Bushley (22 miles west of Rockhampton);
(15) Mount Larcom (47 miles south of Rockhampton, on the North Coast Railway).

The Board visited all the above districts, held thirty-five sittings in twenty-two different centres, and examined 142 witnesses.

The following is a summary of its findings:—

Question I.—The mills now in operation, with the assistance of South Johnstone, are capable of producing 355,000 tons of sugar in a season, and the Commonwealth consumption is 260,000 tons, with a yearly increase of some 5,000 tons, so long as the population maintains the present rate of progression. If sufficient cane were forthcoming to keep all the mills fully occupied, there would be an over-production of some 95,000 tons per annum; but, as the maximum yield in any one year so far has only been 265,000 tons, and Babinda, South Johnstone, and Inkerman Mills are capable of producing another 45,000 tons, there is no reason to anticipate a yield of more than 310,000 tons, increasing to 315,000 tons when the projected additions to existing mills are completed. It is consequently certain that, with the first season as good as that of 1913,

we shall be faced with over-production, though the steady increase in population year after year from natural causes will tend gradually to diminish the amount of such anticipated surplus.

Question II.—It would be unwise for the Queensland Government to erect additional sugar-mills at the present time and under present conditions. With some assurance of adequate protection, assuming that the policy is adopted of producing enough sugar to supply the consumption of Australia in years with average crops, then provision must be made about the year 1920 for an annual increase of 5,000 tons.

Question III.—When the time arrives for further mill construction, the applications submitted to us should receive consideration in the following order, subject to the provisos to be found in the summary at the end of Part III. of our report:—

(1) Banyan, Hull, and Tully Rivers;
(2) Bailey Creek;
(3) Daraji, South Russell, and Babinda;
(4) Freshwater;
(5) Long Pocket.

The provisos mentioned were—

(*a*) Bailey Creek.—If a survey by an engineer proves that satisfactory tramway connection at a reasonable cost can be made with the Daintree River lands over Thornton Range;

(*b*) Daradgee, South Russell, and Babinda.—If when the time arrives for dealing with this application it has been ascertained that the South Russell lands are not required by the Babinda Mill.

Up to the time of writing nothing further has been done in connection with the Bailey Creek lands, while the Daradgee, South Russell, and Babinda lands are now supplying the Babinda Mill.

The Freshwater proposition has also dropped out, the cane from there being supplied to the Hambleden Mill. The erection of the Central Mill at Tully will be dealt with later.

The idea of building a mill at Long Pocket, near Ingham, crops up every now and again. The Haughton River is now served by a mill that was transferred from Invicta, near Bundaberg; while the Rockhampton, Cooktown, and Atherton proposals are at the present time practically dead, and the Silent Grove lands, near Mackay, have now been opened up and supply cane to Farleigh Mill.

The sugar industry was still passing through a critical period in 1917, though the agreements between the Federal and State Governments had counteracted the effect of the Victorian and New South Wales Prices Boards in reducing the price of sugar.

Due to several of the mills being closed in 1916, as already mentioned, for a period of some two months, there was a large crop of stand-over cane in 1917, and this, with the return of good seasons after the 1915 drought, created a large crop of cane to be crushed, the largest ever handled to this date. Most of the mills made an early start, and for a while everything went on well. Then a big strike took place in the Southern States, which held up regular supplies of bags and lime, and prevented the sending of ships for the conveyance of sugar to the refineries. The district of Mackay, then not connected by rail with the

South, suffered most owing to its harbour disadvantages, and the mills had to close on two occasions for several days for want of sugar bags. Due to the transport of sugar being held up, every wharf and store in the sugar areas became congested. Many mills were compelled to add to their storage accommodation at a time when galvanised iron and timber for building purposes was almost unprocurable, and both at a very high price. A few of the Northern factories were obliged to store sugar within the mills, and the loss which ultimately ensued from the double handling required, payments for insurance and storage, and the deterioration of the accumulated sticks during the following wet season, was very high. The Lower Burdekin district did not commence crushing till late, and a good deal of cane had to stand over. The industrial troubles spread from the South to the North, and railway disturbances took place in North Queensland. The year generally, however, was particularly favourable to the growth of cane, and the yield of cane and sugar per acre has never yet been exceeded. The figures are as under:—

Year.	Tons of Cane Per Acre.	Tons of Sugar Per Acre.
1917	24·88	2·83
Average, 1909 to 1918	17·52	2·01

It is remarkable that we have never experienced another year like 1917. when the crops were excellent in all areas except the Logan. The leading district was the Lower Burdekin, which produced 37·77 tons of cane and 4·53 tons of sugar per acre. All natural conditions seemed to combine to produce big crops, and this supplemented by the large amount of standover cane accounted for the high returns per acre.

The yield of sugar in this year was 307,714 tons, constituting the record to date.

This good year from a climatic point of view was followed by a disastrous one, for in 1918 two of the severest cyclones experienced since Queensland was settled by a white population struck the coast causing serious loss of life and immense damage. The first of these two cyclones visited Mackay on 21st January, and was a terrifying experience to the inhabitants, a number of whom were drowned by the high tide, backed up by the cyclone which came up the Pioneer River and spread over a great part of the town. The force of the wind was tremendous, buildings were levelled, mills partly destroyed, telephone and telegraph lines blown over and inextricably tangled, and 6,000 tons of sugar stored at wharves and mills were totally destroyed.

The rainfall during the cyclone week was 63·13 inches, and for the month of January 85½ inches—much more than the average annual fall at Mackay. The news of this disaster did not arrive in Brisbane till the 24th January, and then only meagre particulars came to hand. On the 28th January, Brisbane papers stated that Mackay was in ruins, the buildings on Flat Top Island had been wrecked, and the light extinguished. Bad as the actual disaster was, it was greatly exaggerated at the time. One captain of a passenger boat passing Mackay wired to Brisbane that Mackay had been totally obliterated, and that nothing was left of the township. During this unfortunate occurrence twenty persons were drowned, buildings and churches were wrecked, the Sydney Street bridge was partly carried away—portion of it falling on the tender

PLATE 56.—EFFECT OF HIGH WINDS ON CANE.

"Brinawarr." The tender "Tay" broke from its moorings, got under the bridge before it collapsed, and was deposited on the river bank some little distance inland. During the height of the cyclone the mercurial barometer at the Post Office was not read, but the barograph recorded 27·55 inches, the lowest ever recorded in Australia.

In addition to the 6,000 tons of sugar absolutely lost, a great deal on wharves and in mill stores was badly damaged, and this had to be reconditioned. Fortunately, the Commonwealth Government came to the rescue, and promised to bear any loss in connection with the sugar that had occurred. But for the shipping delays and strikes in 1917 the whole of the season's sugar would have been removed before the cyclone occurred, and this great loss would not have occurred. It should remain an object lesson on the advantage of the rapid transport of stocks of sugar before the wet season sets in. At the outset it was estimated that 30 per cent. of the sugar-cane in the district was irretrievably ruined, but the ultimate loss was much greater than this; nor did the land recover the effect of the very heavy rains for some two or three years afterwards.

As if all this was not bad enough, a furious cyclone again visited the coast, centring principally at Innisfail and Babinda. This took place on 10th March, 1918. These two townships were almost completely wrecked, and eight persons were killed at Innisfail. The cane was greatly injured, and beautiful scrubs in these districts were largely destroyed.

At this time the cane in North Queensland was much further forward than at the time of the cyclone in Mackay, and it consequently suffered a great deal more damage from the actual wind. Rain and floods also interfered with the cane from the Herbert River to Proserpine. The giant scrubs about Cairns were badly knocked about, tangled and blown over, so that instead of the impenetrable jungle that usually met the eye, it was possible to see through the scrubs for very great distances.

Much damage was also caused to the sugar-mills in these Northern areas.

All the cane in Queensland was light this year, even in the districts not affected by the cyclones.

A few of the smaller sugar-mills closed down about this period, such as Goodwood, Miara, Waterloo, Nerang, and Baffle Creek.

The initiation of the Sugar Experiment Station at South Johnstone, near Innisfail, took place this year.

The year 1919 was another dry period and the crops were light, the yield of cane and sugar being even below the previous cyclone years. A maritime strike took place also which again held up bag supplies and transport of sugar. Six sugar-mills did not crush, due to the dry season, and much of the crop in Southern districts was sold for forage purposes.

During 1919 the Invicta Mill, in the Bundaberg district, was removed to the Haughton River district, between Ayr and Townsville.

Manures were very difficult to obtain at this time, nitrate of soda and sulphate of potash being unprocurable. Muriate of potash started to come into Queensland for the first time in any quantity, and soon began to be used in mixed fertilisers.

A second Federal Royal Commission was appointed this year, consisting of A. B. Piddington, N. C. Lockyer, and S. Mills. They were given a large number of questions to investigate, such as the natural

value of the industry, comprising acreage, capital invested, number employed, wages, production, Government control, protection, beet sugar, and Empire preference.

This Commission took a considerable time to carry out its investigations, and had to obtain three extensions of the period in which they were to make their report. The Commission was not of the same calibre as the first Federal Royal Commission, and proceedings were conducted on a free and easy plan—a go-as-you-please style—with everybody interrogating, so that questions and answers occasionally got mixed up in the report of the evidence which was not published in question and answer form, but in narrative fashion. The Commission sat into 1920. Persons outside the Commission were allowed to travel around with the members and to put questions to witnesses, very often in the middle of the Commissioners' own questions. The report ran into fifty-six pages, and the evidence to another 600 pages.

The Commission made a number of recommendations, including the general control of the cane sugar industry by the Commonwealth exercised through a body that might be called the Commonwealth Sugar Control, consisting of three Commissioners, and that an increase in the price of raw sugar from £21 to £22 per ton would be justified. This last recommendation would have given little satisfaction to the industry, but as a matter of fact the whole report fell dead on the action of the Prime Minister (Mr. W. M. Hughes) in materially enhancing the price in 1920 without any reference to the findings of the Commission.

The Commission's report was dated 27th February, 1920, and we may now go on to that year.

For some time past sugar-growers and millers felt they were being treated unfairly in the matter of price, and a conference took place at the Department of Agriculture early in 1920. At that conference it was decided that a deputation should wait on the Prime Minister of the Federal Government and request that the price of sugar should be increased from £21 to £30 6s. 8d., and that an agreement to that effect be made for a period of not less than three years. This deputation proceeded to Melbourne and afterwards met in Sydney with representatives of the Queensland and Federal Governments and other branches of the industry. The Prime Minister finally acceded to the request under certain conditions, which will be dealt with in a succeeding article dealing with the history of the course of prices.

The drought which affected the crop in 1919 persisted into 1920, February and March being abnormally dry. This following on the severe dry weather experienced in October, November, and December of the preceding year considerably shortened the crop, and though it recovered to a great extent above Townsville, it was unable to make any such recovery in Southern Queensland, where the crushing was again a small one.

A cyclone was experienced at Mossman in the early part of this year, which did a great deal of damage to cane and farmers' dwellings.

In the year 1921 the industry was blessed by a good season, and this fact, combined with the better price for sugar, gave a great impetus to sugar-growing in the following years. The rainfalls at some of the far Northern sugar areas were particularly heavy, and it was at this time that a beginning was made of opening up further new areas of

land for canegrowing to supply existing mills. Improved railway communications assisted matters, the line from Brisbane to Mackay being opened for traffic in September of this year. This led to considerable settlement to the south of Mackay for sugar-growing. The yield of sugar this year, though it did not come up to 1917, was the largest since that date—viz., 283,198 tons of sugar.

It was felt at this time that this rich tropical belt of fine land, comprised in the Banyan and Tully areas, between Cardwell and Innisfail, should be opened up for sugar-growing. The settlers in that district had taken up a good deal of the land in the hope that a mill would be erected, and it was one of the locations included in the recommendations of both the 1911 and 1916 Commissions, standing first on the list of the latter. The steps taken towards the erection of the Tully Mill will be dealt with in the next section.

[TO BE CONTINUED.]

Bureau of Sugar Experiment Stations.

CANE PESTS AND DISEASES.

WIREWORM DAMAGE.

In connection with the considerable damage to cane caused by wireworms in the Mackay district, the Assistant Entomologist, Mr. R. W. Mungomery, recently visited that district, and in reply to inquiries as to advice on this subject has submitted the following notes to the Director of Sugar Experiment Stations, and these notes are now made available for publication:—

From information gathered during the course of my recent investigations on the wireworm pest in the Mackay district, it seems that the life cycle of the insect which is responsible for the greatest amount of damage there is of at least a year's duration or more, and moreover, the period of oviposition of the adult beetles or "click beetles," which are responsible for the appearance of wireworms, appears to be a very protracted one. From this it will be evident that the pests are active over a considerable portion of the year, and there appears to be no quiescent period during the time when the greater part of the cane planting is carried out in the Mackay district. For this reason, no safe planting time can be recommended. At best, one must endeavour to plant during the warmer months of the year—i.e., early planting in March or April and late planting in August and September.

In combating wireworm attack, the essential point to keep in mind is to get the plants away as quickly as possible, and any means that will bring about this desirable end should be employed. By planting, therefore, in these warmer months, every encouragement is given for the plant to strike quickly, maintain its rapid rate of growth, and soon get past the critical period during which it is liable to injury. To plant in June and July in land where wireworms are suspected of being present is usually disastrous, for at such times plants are very slow in coming away, and are much more liable to injury.

Wireworm attack is most severe on low-lying land which is poorly drained, and which, in consequence, remains wet and cold. On this type of land more attention should be paid to bedding, and the water furrows deepened sufficiently to allow the water to flow off as quickly as possible. Though it is wise to drill fairly deep furrows when lining out at the time of planting, only a small amount of earth should be filled in as a covering for the plants, and this will facilitate rapid germination.

Good thick plants, of vigorous growth, should be used, and spacing should be close, so that if one plant is damaged, and a miss results, blank spaces between stools will not be so great.

After these precautions have been taken, it may still be found that wireworms are responsible for sufficient damage to cause annoyance. Obviously it is futile to soak the cane set in any poisonous solution, in the hopes of poisoning the pests, for this solution merely protects the set and not the growing shoot, which is the portion mainly attacked. The reputed remedy of using basic superphosphate in the drills at the time of planting seems to have yielded no results to substantiate the claims made for this fertiliser in this connection. The use of sulphur mixed in with other fertilisers likewise appears to be a failure in preventing attack.

Recourse must then be had to the use of some repellent, and experiments have been laid down on certain farms in the Mackay district, using the following chemicals:—

(1) Crude naphthalene sprinkled in the furrow just above the plant, at the time of planting and at the rate of one-eighth ounce to each cane set.

(2) The above quantity of naphthalene mixed with eight to ten times its weight of burnt lime and applied similarly to the former. The lime is used as a diluent, and also with the object of keeping the ground more open and allowing a better vaporisation of the naphthalene.

(3) Dropping orthodichlorobenzene at regular intervals in the drills at the time of planting.

Although it is premature to discuss the relative value of the above chemicals in warding off wireworm attack, it is hoped that some measure of relief will be gained from the results of these experiments, and farmers are advised to follow along the lines suggested above. Crude naphthalene is obtainable from Taylors and Elliotts Ltd., Charlotte street, Brisbane.

The use of burnt lime at the rate of 30 cwt. to 2 tons per acre also appears to have yielded lasting results. The lime should be applied before the second or third ploughing. It is not claimed that the burnt lime will have any immediate insecticidal action, but it renders the soil in better physical condition, and whether or not it has any other effect on wireworms is not yet quite clear; however, evidence points to the fact that cane planted on land treated with burnt lime has suffered no damage and excellent crops have resulted. Growers would be well advised to give this treatment a thorough trial in a small way.

ENTOMOLOGIST'S ADVICE TO CANEGROWERS.

By EDMUND JARVIS.

Growers who are contemplating fumigating their cane next year to control grubs should order their materials early, as there is a very large demand for these materials, and Australian stocks are limited. The order should be placed early enough for a supply to come from England should the agents not have enough on hand to fulfil requirements.

Names of firms supplying the necessary fumigants are available on application to the Bureau, and, if possible, it is better for growers to obtain fumigants through their local board or association, as most firms offer a reduction in price for large quantities.

Neither paradichlorobenzene nor carbon bisulphide deteriorate in any way as long as they are kept closed up in their original containers, so it is far better to order early than to wait till grubs appear on the farm and then be disappointed because fumigants are unobtainable.

Army Worms.

Towards the end of September invasions by the army worm or plague caterpillar are very common, and in order to combat these pests farmers should keep on hand a spray pump of the knapsack type and supplies of lead arsenate and Paris green. Directions for poisoning army worms have been published at frequent intervals, and assistance or advice may always be obtained by applying to the Meringa Experiment Station either by letter or telephone.

The main essential in dealing with army worms is for remedial measures to be adopted at once, as caterpillars are capable of stripping the foliage from a whole field of cane within a few days, and, although the cane will recover, yet it suffers a very severe check from the loss of leaves.

The "Frenchi" Grub.

Grubs of the "frenchi" cane beetle, which have been deep down in the ground for some weeks, will commence feeding again shortly, and patches of wilting cane will mark their appearance. The work of this grub almost always occurs in patches, and when these are noticed it is a good plan to fumigate stools in the neighbourhood of the damage.

Carbon bisulphide is very effective for poisoning "frenchi" grubs, and particulars of its use in that connection are published in pamphlet form by the Bureau.

Owing to the winter rains experienced throughout the North this year, these grubs will probably be much in evidence, but the amount of damage caused by them will be considerably lessened should further rains occur during September and October.

Moth Borers.

Headlands should be cleaned up as far as possible in order to minimise the damage caused by moth borers. The typical damage caused by these caterpillars consists of "deadhearts" in the cane, although sometimes they tunnel in the base of large sticks of cane. It is nearly always in close proximity to a dirty or grass-grown headland that the damage occurs, hence the advisability of keeping headlands clean and free from weeds.

General.

The liability of damage by quite a number of pests, including borers, grubs, and wireworms, can be lessened by regular cultivation of the inter-rows, and this point cannot be too strongly emphasised.

QUEENSLAND'S SUGAR PRODUCTION.

The Registrar-General, Mr. George Porter, has issued the following bulletin:—

On the 16th December, last year, an estimate of the probable result of the sugar crop for the 1929 season was issued from this Department. It was then calculated that there would be 508,332 tons of sugar made at 94 net titre from 3,592,189 tons of cane.

Final figures show that thought the tonnage of cane (3,581,265) was less than the estimate, the quantity of sugar made at 94 net titre was 518,516 tons, or 10,184 more than the preliminary figure.

In 1928 the production of sugar at 94 net titre amounted to the record figure of 520,620 tons, which is 2,104 tons more than in the 1929 season. However, the 1929 yield is the next highest ever recorded in this State.

Thirty-five mills again operated during the year, and the particulars of the output in each sugar-growing district of the State is shown hereunder, figures also appearing for several previous years:—

Division.	Tons of Sugar Made at 94 Net Titre.				
	1925.	1926.	1927.	1928.	1929.
Rockingham	216,755	221,104	228,839	255,188	273,820
Edgecumbe	171,511	117,807	170,596	184,343	173,454
Wide Bay	85,360	42,669	78,757	75,850	63,287
Moreton	11,959	7,692	7,553	5,239	7,955
Total State ..	485,585	389,272	485,745	520,620	518,516

Note.—It should be here explained that though the total tonnage of cane crushed and sugar made as shown for the State are final figures, the totals for the divisions for the year 1929 are liable to revision; figures for previous years are final in every case.

The figures quoted in this Bulletin for 1929 for divisions or districts show the actual quantity of cane crushed and sugar made at mills in each division, whether the cane was grown in that division or not. When complete statistics of the sugar industry are available it is possible to allot the cane crushed to the division in which it was grown, and a corresponding transfer of sugar is then also made.

Final figures will appear in the printed report of the Registrar-General on agricultural production. They will probably show a still greater increase in production in Rockingham and a still greater decrease in Edgecumbe when compared with 1928 production.

It will be noted that though the total production decreased in 1929, there was an increased output in the far Northern District (Rockingham) of 18,632 tons compared with 1928, and also of 2,716 tons in the Southern District of Moreton. These increases were, however, more than counterbalanced by a decrease of 12,563 tons in the Wide Bay divisions, and 10,889 in Edgecumbe. The percentage of the total production in each division was—Rockingham 52.81, Edgecumbe 33.45, Wide Bay 12.21, Moreton 1.53.

The weight of cane crushed during the last five seasons, together with the area from which such cane was taken was—

Year.	Tons of Cane.	Acreage.
1925	3,668,252	189,466
1926	2,925,662	189,312
1927	3,555,827	203,748
1928	3,736,311	215,674
1929	3,581,265	*223,730

* *Note.*—The acreage for 1929 is an estimate made by the mills only, the final figures from the Agricultural Collectors' books will not be available for about a month.

The yields per acre for the 1929 season were 16.01 tons of cane and 2.32 tons of sugar at 94 net titre, but these figures are liable to revision when the final figure for the area crushed is available.

The average tons of cane required to make one ton of sugar were 6.91 compared with 7.18 in the previous year.

Similar figures showing the percentages in each district in 1929 were—

District.	To Each Acre Crushed.		Tons of Cane to Make one Ton of Sugar.
	Tons Cane. *	Tons Sugar. *	
Rockingham	19·49	2·91	†6·70
Edgecumbe	14·18	2·09	†6·78
Wide Bay	12·01	1·49	†8·05
Moreton	14·40	1·89	†7·62
Total State	16·01	2·32	6·91

* Based on mill estimates of acreage only.

† Liable to revision.

Percentages for five years for the State were—

Year.	To Each Acre Crushed.		Tons of Cane to Make One Ton of Sugar.
	Tons Cane.	Tons Sugar.	
1925	19·36	2·56	7·55
1926	15·45	2·06	7·52
1927	17·45	2·38	7·32
1928	17·32	2·41	7·18
1929	*16·01	*2·32	6·91

* Based on mill estimates of acreage only.

It will be noted that the sugar content this season was highest in the Rockingham (far Northern) district, followed in order by Edgecumbe, Moreton, and Wide Bay. The average sugar content for the State was higher than in any previous season.

The tonnage of cane required to make one ton of sugar has gradually decreased from 9.44 in 1900 to 6.91 in 1929, due both to improvement in cane varieties and higher efficiency in sugar mills. The following figures will illustrate the downward trend:—

Year.	Tons of Cane to Make One Ton Sugar.
1900	9·44
1905	9·27
1910	8·73
1915	8·20
1920	8·00
1925	7·55
1929	6·91

During the twelve months ended 30th June, 1930, approximately 180,694 tons of sugar were exported direct overseas from Queensland, the value of same being set down at £2,194,245, or approximately £12 a ton. This valuation has been made on overseas realisation prices and not on the local price, which is approximately £26 per ton. Previously the value of overseas exports of sugar has been been shown in export statistics on the basis of the Australian price. In 1928-29 198,120 tons were exported, the value on the basis of the Australian price being £5,189,752.

The value of cane crushed in 1928 was estimated to be £7,209,778, while the value of the output of sugar mills in 1928-29 was £10,810,466.

Sufficient data is not yet to hand to value the cane crushed in 1929, and manufacturing statistics for 1929-30 are only now being collected. Therefore, later figures are not available, but as the quantity of cane crushed in 1929 and the production of sugar therefrom was somewhat lower it may be assumed, seeing that the price obtained overseas was probably lower also, that the values will be less than those quoted for the previous year in each case.

The production of sugar in Queensland per head of population, in 1929, was 1,256 lb. It is estimated that the consumption per head is about 120 lb., the balance being available for export to other States or overseas.

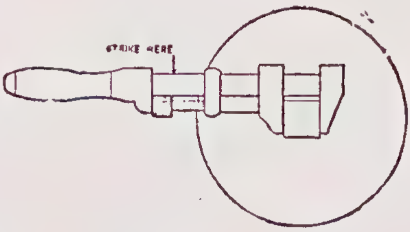
In addition to sugar made, the output of molasses from the mills during the year amounted to 15,861,948 gallons, which was disposed of as follows:—

	Gallons.
Sent to distilleries	5,638,465
Sold, &c., otherwise	215,933
Burnt	4,202,580
Food for stock	2,382,192
Used for manure	298,395
Run to waste	2,837,482
Held in stock, &c.	871,292

STARTING SCREWS.

IN CLEAN-OUT COVERS OF TRAPS.

Considerable difficulty, often-times, is experienced in starting the screws when



removing brass clean-out covers from traps. A good way is to give the wrench a few sharp strokes with a hammer at the point indicated in the sketch.

ROYAL NATIONAL EXHIBITION.

QUEENSLAND'S BOUNDLESS NATURAL WEALTH MIRRORED IN A GREAT SHOW—THE RESOURCES OF THE STATE ARRAYED IN FULL RANGE—A GENERATOR OF OPTIMISM AND AN EXEMPLAR OF OPULENCE—A FOUNTAIN OF PROGRESSIVE IDEAS—RIPE FULFILMENT OF EARLY PROMISE REVEALS A VISTA OF VASTLY GREATER ACHIEVEMENT IN THE YEARS AHEAD—THE VALUABLE WORK OF THE ROYAL NATIONAL ASSOCIATION—A COMBINATION OF COURAGE, INTELLIGENCE, INDUSTRY, AND ENTERPRISE.

Held on 11th August and following days, the Fifty-fifth Annual Show of the Royal National Association was an unqualified success from every point of view.

Every exhibit in the pavilion, paddock, and pen was an education, as well as evidence of high standards of skill, and of the wide field of opportunity and achievement that Queensland presents to the worker with hand and brain.

The Show represented an extraordinary diversity of production and rural interests, and from what was seen of the magnificent array of the products of Queensland industry it is hard to place a limit on any forecast of our future progress and prosperity.

In the ring stock were paraded in great numbers, and were never so uniform in quality.

The heavy horses, notably Clydesdales, showed no decline in breeding, condition, and schooling. Hunters, hacks, and remounts were remarkable for evidences of clean breeding and good training.

The cattle, both beef and butter, were splendid representatives of their respective breeds.

The pigs proved that the marketing lessons of the year had been well learnt, and that Queensland breeders are getting right away from valueless fat to lean meat baconers of early maturity and goodly weight for age.

Gathered together daily in the Grand Parade was as fine a collection of stock, for variety and quality, unexcelled in any show ring in the Commonwealth. The parade was a majestic spectacle, in which the monarchs of Queensland's pastures wore their honours royally and won the applause of a keenly critical crowd.

The 1930 Show stood as a working model of Queensland to-day, as a reflex of rural development, and as an epitome of industrial progress; it presented, in short, abundant evidence of all those things, spiritual as well as material, of which a nation is built.

THE OPENING CEREMONY.

DELIGHTFUL August weather, days of dazzling sunshine with a wintry chill still lingering in the shadows, favoured the Royal National Association for this year's Exhibition.

The Show was opened officially on Wednesday, 13th August, by His Excellency the Governor-General, Lord Stonehaven, accompanied by Lady Stonehaven, in the presence of an enormous gathering. Their Excellencies Sir John and Lady Goodwin assisted at the opening ceremony.

The Vice-Regal visitors were received by Mr. Ernest Baynes (President of the Royal National Association), who in the course of a cordial welcome said that in this year's Show thousands of good agriculturists and leading stud masters had come forward in one great co-operative effort to display the true wealth of Queensland and other States of the Commonwealth.

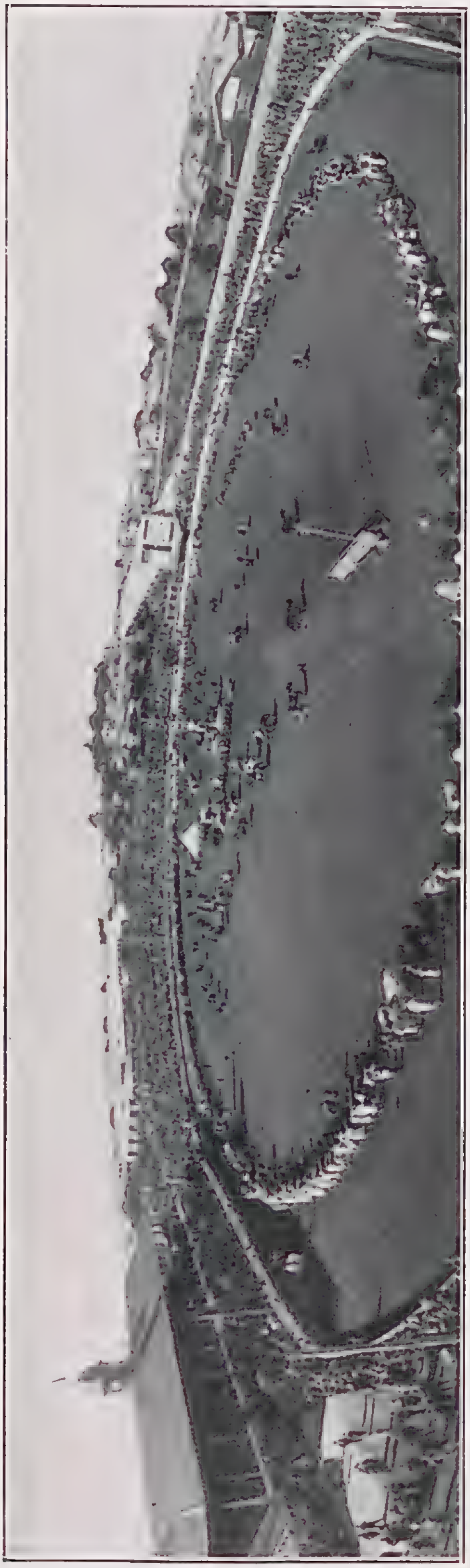


PLATE 57.—ROYAL NATIONAL SHOW, BRISBANE, 1930. A PANORAMA OF THE ARENA.

"The district exhibits and Departmental courts," he added, "together with the displays made by the fruit district representatives, and the general display of agricultural produce, including that splendid exhibit of Warwick wheat, certainly provide our best exhibit in agricultural produce at Bowen Park.

"The dairy cattle show on this ground to-day must stand as the finest cattle show in the world, for there are no fewer than 807 animals stalled, and the competition right through the whole section is particularly keen. The scene at the judging ring when the classes for aged cows in milk were paraded was wonderful evidence of what has been attained in the breeding of high-class stock. The showing in stud beef and fat cattle is more representative than it has been for some years."

In conclusion, Mr. Baynes said the council had been pleased to continue throughout its every section an educative influence. They had planned that the Show should have the brightest possible aspect, and with it should provide a stimulation and reassurance of that confidence which they should all have in such a great country as this. They trusted that, with the closing of the Show, that reassurance would have been accomplished, that the immediate prospects would brighten, and that Queensland would continue onward in her march of progress.

In declaring the Show officially open, His Excellency the Governor-General (Lord Stonehaven) said he thanked the council most warmly for the kind welcome which they had given to Lady Stonehaven and himself. "We are delighted," he added, "to be present with you on a day which is so fittingly set apart as a public holiday. Your Exhibition affords abundant and appropriate cause for rejoicing, and it is a real pleasure to us to share with you in the legitimate pride with which you have referred to the wonderful demonstration of Queensland's natural resources, for which, year by year, for the past fifty-five years, this National Association has afforded an opportunity. For generations past it has been recognised in Great Britain that nothing does more to stimulate progress and efficiency in all branches of agricultural and pastoral industries than the work of associations such as yours; by the prizes offered at annual Exhibitions you provide a most powerful incentive to the raising of standards all round, and the high standards are the only ones worth aspiring to or being satisfied with."

Uuparalleled Possibilities.

"Fortunately, the climate and the soil of Queensland," added His Excellency, "offer a range of possibilities which it would be difficult to find a parallel for in any part of the world, and the numbers and quality of the exhibits are eloquent testimony of the capacity and determination of Queenslanders to develop their splendid birthright.

"The association," continued His Excellency, "was doing great work in another direction. It afforded a legitimate opportunity to the men and women who lived and worked on the land to enjoy a well-earned holiday in the capital of Queensland, and to their fellow-countrymen who dwelt in the city it furnished an opportunity of realising the magnitude and importance of the State's agricultural and pastoral resources. Most important of all, perhaps, the Exhibition brought home to every one a real community of interests which united the well-being and prosperity of town and country. He congratulated them most warmly on the continued and uninterrupted expansion of their successes. It had not been achieved without much hard work, a great deal of it performed gladly as a national service without any pecuniary remuneration. The value of that service to the State could not be exaggerated, and he thought it could fairly be said that the support they received from exhibitors showed how greatly it was appreciated. He would like to congratulate them, too, on the combination of courage, intelligence, industry, and enterprise which could alone have brought the exhibits to the high state of perfection which they saw to-day. To one and all he would like to offer sincerest wishes for their continued happiness and success."

OTHER ADDRESSES

Economic Unity.

In the course of a notable address at the official luncheon, His Excellency the Governor-General, Lord Stonehaven, said: "We all share in the one great birthright over the rest of the world, and that is Imperial citizenship. Because we are sharers of that birthright I look upon myself as a fellow-countryman of yours, just as you have the right to consider yourselves fellow-countrymen of mine, if I should meet you in Edinburgh.

PLATE 58.—AN OFFICIAL GROUP AT THE OPENING.

Included in the gathering are (front row) their Excellencies the Governor-General Lord and Lady Stonehaven; their Excellencies the State Governor, Sir John and Lady Goodwin; the Premier, Hon. A. E. Moore and Mrs. Moore; the Chief Justice, Sir James and Lady Blair; the Lord Mayor of Brisbane, Mr. W. A. Jolly and Mrs. Jolly; the Leader of the Opposition, Hon. W. Forgan Smith and Mrs. Forgan Smith; the President of the Royal National Exhibition, Mr. Ernest Baynes and Mrs. Baynes; the Minister for Agriculture and Stock, Hon. Harry F. Walker; the Minister for Roads and Railways, the Hon. Godfrey Morgan; the Minister for Mines, Hon. E. A. Atherton; and the Treasurer, Hon. W. H. Barnes and Mrs. Barnes.

"That brings me to a consideration of the need for closer economic unity between the home country and the distant parts of the Empire. In Great Britain we are striving, as you are here, for an ideal high standard of living. To maintain that high standard of living, however, it is necessary that you should live in circumstances which enable you to earn the wherewithal to pay for it. The whole Empire must in the future be regarded as one great Commonwealth. If we considered ourselves as isolated units, and not as members of a great kinship of brotherhoods of people scattered over the world, inevitably the standard of living would depend on the resources of the particular country in which we happen to live. That, however, is too narrow a viewpoint. We have to regard the matter from the standpoint of our over-riding Imperial nationality. The British Empire produces within its boundaries everything in the way of food and raw material that mankind could desire. It is so extensive that it has every variety of climate and every type of production. We of the British Empire have a past made glorious by efforts and achievements such as no other nation can show. It is by a closer union of commercial interests between the United Kingdom and the various parts of the Empire that we can look forward with absolute confidence, not only to the maintenance of the standard of living we have had in the past, but to the raising of that standard. The great need is to stimulate production from every part of the Empire, and to secure the efficient marketing of those products in the Homeland."

Increased Efficiency—Empire Marketing.

"This Exhibition," continued His Excellency, "has provided a wonderful demonstration of the important part that Queensland and Australia can play in that endeavour. The activities of your society provide a marvellous means of educating the people as to the wonderful resources of this State. A visitor to the Show must be very stupid who does not realise that it presents opportunities for learning many things which will be useful to him throughout his life. The fine exhibit in the meat pavilion, and the magnificent show of dairy products in the butter pavilion, are in themselves highly educative. In the butter pavilion is a chart which shows very plainly the wonderful advance that has been made in the dairying industry of this State. It is shown that between 1910 and 1929 the dairy cattle increased in numbers from 365,000 to 740,000, and the output of butter increased from 31,500,000 lb. to 70,750,000 lb., while there has been a proportionate increase in the cheese produced. That shows clearly that by means of increased efficiency in industry we are now obtaining a higher yield per head from our dairy cattle. That is an important indication of progress. I realise that in Australia you cannot consume the total amount of your farm produce, and it is necessary to find markets abroad. In England, on the other hand, we are in a position of having to import a large proportion of the foodstuffs we require. What we want in England is more foodstuffs from inside the Empire, displacing that which is coming in from other countries. I would strongly urge you to develop your meat industry in Queensland, with a view to supplying the needs of Great Britain. Unfortunately, statistics show that the exports of frozen beef and mutton from Australia represent a remarkable shrinkage as compared with the imports from foreign countries.

Community of Interests.

"That brings us to the community of interest on the part of all sections of the British Empire, and the necessity for uniting together to overcome the competition of foreign countries on the home market. I think that your Show does an invaluable work in bringing home to all and sundry the fact that it is only by using our utmost intelligence and by honest hard work that we can attain to the highest efficiency. It is this efficiency in industry and ingenuity in displaying your goods that is required to place your products on the tables of the people in the homeland, who would prefer to be your customers than those of foreigners. The question is how this desideratum is to be attained. Whether it be in peace or war, teamwork is essential to success. It is necessary that we should be as thoroughly organised commercially as politically. If we can transfer to the economic sphere the same activity that we are devoting to the political sphere, it is certain that economic conditions throughout the Empire will be greatly improved. If that teamwork is achieved, you will find that the difficulties with which we are manifestly surrounded at present—in common with all parts of the world—will speedily be overcome.

"Your president has referred to my impending departure. With the improved means of communication existing at the present day, the various parts of the Empire have been brought closely in touch with Great Britain, and I look forward to having an opportunity on some future occasion of visiting your Show. I hope that I will then be one of the crowd of spectators to join in a welcome extended to the King's representative, such as I received to-day.

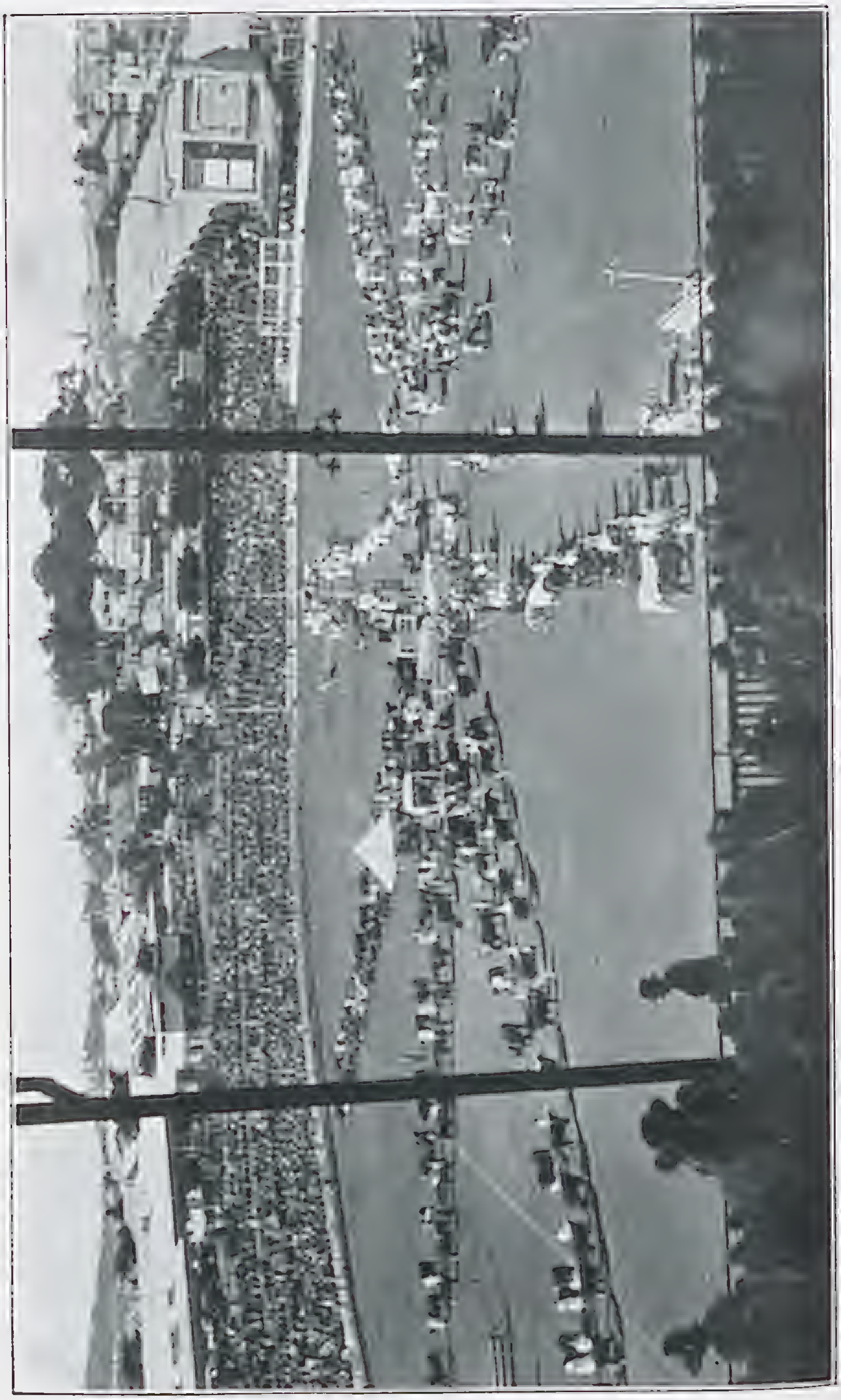


PLATE 59.—A GRANDSTAND VIEW OF THE STOCK PARADE.

No Limit to Expansion.

"As to Queensland, this is a country in which there is no limit to the expansion of which you are capable, and the prosperity you may enjoy. There is no part of the world which is more favoured by Nature, but in order that you may maintain the high standard of living which now exists it is necessary that every man and woman must give of their best. As far as Great Britain is concerned, we welcome your exports of butter and meat, and we will collaborate and co-operate with you as far as we possibly can in marketing your products in the old country. By doing that we will be contributing to the happiness of your people, who, though separated from us by 12,000 miles of sea, are imbued with the same ideals of loyalty as ourselves—loyalty which flourishes as strongly here as in any other part of the British Dominions." (Cheers.)

Speech by the State Governor.

The Vice-president (Mr. P. J. Symes), in proposing the health of His Excellency the Governor, said that both Sir John and Lady Goodwin, by their visits to all parts of Queensland, had contributed much to the happiness of the people. Sir John was essentially an optimist, and in his journeyings throughout the State he radiated a confidence in its future prosperity.

Sir John Goodwin, in reply, said he had spoken many times before of the high value he placed on the work of the Royal National Agricultural Association. One of the most valuable spheres to which it extended its work was that of education. It did one good to see young people watching the judging and judging themselves. It also was a pleasure to see the number of people who came to the Show discussing the exhibits, and thereby gaining a large amount of knowledge which would help to improve methods in the future. There were over 41,000 people at the Exhibition on the previous day, and he had met and conversed with many, and had gathered that they were all learning. It was of immense importance that the people of the cities should know how those of the country earned their living and how they were producing the primary products which were on view at the Exhibition. Were it not for the Show many people would inevitably be in ignorance of conditions which governed the North and West of the State.

One very important lesson was to be learned from the Show—Queensland must be up-to-date and follow modern methods. There could be no standing still. We must always move forward, improving our methods and learning fresh scientific facts. Queensland had to produce the very best, and the very best which the State had produced to date was to be seen at the Show. He was particularly impressed with the dairy cattle, but even that high standard must be not only maintained but raised, so that the country would be able to compete in the markets of the world. He did not think a better meat exhibit could be shown in the world than was on exhibition in Brisbane this year. Individuals must all give of their very best ability in their jobs in order to help the country to place on the world's markets the goods that it was so favoured in being able to produce.

A Vice-Regal Optimist.

"It has been said I am an optimist," continued His Excellency. "Of course I am an optimist. I talk a lot to the children of this State, and learn a good deal from them. A child a little time ago was asked the difference between an optimist and a pessimist. He answered that an optimist was a man who attended to your eyes, and a pessimist one who looked after your feet. (Laughter.) I think that answer is not altogether wrong. An optimist is a man who learns lessons from past experiences and who realises difficulties of the present, and also those which may continue or arise in the future. With a clear vision he looks forward to the future, and does not get depressed; he envisages how his difficulties may be overcome, and he will come out on top in the end. The pessimist's vision does not rise higher than his feet, and he gets depressed at any difficulty and fails to look forward to its surmounting.

"There are two chief reasons why I am an optimist," explained Sir John. "The experience of Queensland which I have had during the past three and a-half years has convinced me that this State can produce the very best; and I believe that Queensland will face all difficulties and emerge triumphant over them all." His Excellency went on to say that a former Governor of an Australian State had told him before he left England that he should avoid two terms—"immense potentialities" and "recuperative capacity." But he could not help observing that Queensland had a power for recovery which was not equalled by any other country in the world.

PLATE 60.—UNDER THE CRITICAL SCRUTINY OF THE RINGSIDE CROWD.

A portion of the Grand Stock Parade of Animals representative of many of the most famous families entered in British and Australian Herd Books.

Advantages of the Show.

The Premier of Queensland (Mr. A. E. Moore) proposed the toast of "The Royal National Agricultural Association." He said that Queensland was extraordinarily fortunate in having such an association. He knew of no organisation which was doing work of a greater value to the State and the Commonwealth. One of its many virtues was that it was pointing out the need in Australia for efficiency and for striving after the very best results. It also conferred an opportunity on the individual to exhibit his industry, efficiency, and enterprise in the best possible way. Queensland had one of the greatest opportunities that had been given to a nation—that of becoming a foremost food-producing country—and the Royal National Agricultural Association of Queensland was standing like a fingerpost, indicating to the people that good enough was not good enough, and that the State must produce only the very best. That was illustrated very well in the Exhibition, where all strove to give something a little better. The association was succeeding in doing that, and its success was a big factor in the progress of the country.

The Chairman of the council of the association (Mr. J. Hiron), in his response, said the association appreciated very much the interest which His Excellency the Governor-General (Lord Stonehaven) and Lady Stonehaven and his Excellency the Governor (Sir John Goodwin) and Lady Goodwin took in the Show and in the society's work. No show would be anything if they did not have exhibitors, and to them a large share of the credit was due.

Plate 61.—The Brisbane Show Breeds Optimism.

A cheerful ringside group. Left to right—The Premier, Mr. Moore, and the Rev. Rabbi and Mrs. Levine, Mrs. A. E. Moore, Mrs. Forgan Smith, and the Leader of the Opposition, Mr. Forgan Smith.

PLATE 62.

That the horse is still a factor in successful farming was demonstrated by this parade of Clydesdales at the Brisbane Royal. Notwithstanding the great increase in mechanical transport, the horse is still the more economical power for short hauling and for working the smaller arable areas.

THE COURT OF AGRICULTURE.

REPRESENTATION AND REVIEW OF DEPARTMENTAL ACTIVITIES.

THIS year's display of the Department of Agriculture and Stock was a departure from the models of former years, and a number of new features were introduced, both in the general design and in the case of individual exhibits.

In the lay-out of the Court the key industries of Queensland, wool and sugar, occupied the central position on two wall displays 150 feet in length. In each instance the superstructure of the central trophies took the form of a massive arch supported by pillars of wool and sugar-cane, flanked in the case of the wool with a comprehensive array of cereals. The sugar trophy was supported by dairying and tobacco displays, with two smaller panels illustrating the swine and poultry industries.

Occupying most of the floor space of the Court was a field of cotton ready for harvesting, with a small vine-clad settler's hut in the background. By this arrangement public attention was focussed on cotton, a crop with improving prospects both on the cultural and manufacturing sides.

Entomology and plant pathology were picturesquely panelled. The destructive agencies of plant life, also the highly scientific and technical work necessary to cope with them, were graphically illustrated.

The complexity of modern country life, the attainment of high standards of husbandry, and every phase of rural economics in one phase or another were illustrated effectively in the Departmental Court.

The public was informed by gripping epigram of the vast value of our primary production and the importance of its place in the economy of the Commonwealth.

QUEENSLAND'S WEALTH IN WOOL.

The design of this year's wool exhibit varied considerably from that of previous shows, and was placed in close proximity to the wheat exhibit, the association suggesting that sheep and wheat offer the best possible combination for districts where cultivation is practicable.

The exhibit was arranged with the express purpose of illustrating the activities of the Departmental Sheep and Wool Branch under the control of the Senior Instructor in Sheep and Wool, Mr. James Carew, assisted by Mr. J. L. Hodge. An important part of this work is purely instructional. Sheep farms and holdings in different parts of the State are visited regularly for this purpose, and modern methods of animal husbandry successfully inculcated.

Under the farmers' wool scheme, designed by Mr. W. G. Brown, formerly Instructor in Sheep and Wool, a greater quantity of wool was received for classification this year than previously, which indicates that the small grower appreciates this excellent Departmental service. Out of 108 consignments received, seventy classes were made, each class being distinct. Thus the buyers may know the class of wool they are purchasing, and in consequence the Departmental brand is becoming increasingly popular. This season 108,380 lb. of greasy wool were sold, averaging just under 9d. per lb., a price that emphasises the marked decline in values of recent years.

In order to assist growers in determining the value of their pasture samples of grasses are secured regularly for analysis, and the information so derived is made readily available. The system and its results were well illustrated in the Departmental Court.

Scoured wool was a very attractive feature of the wool display, which consisted throughout of first quality counts and classes.

Manufactured materials, the product of Queensland woollen mills, illustrated the greater possibilities of this side of the industry, as well as the progress in spinning and weaving already made in the State.

The whole range of activity in the pastoral industry from the pasture to either the loom or the freezer was set out very effectively.

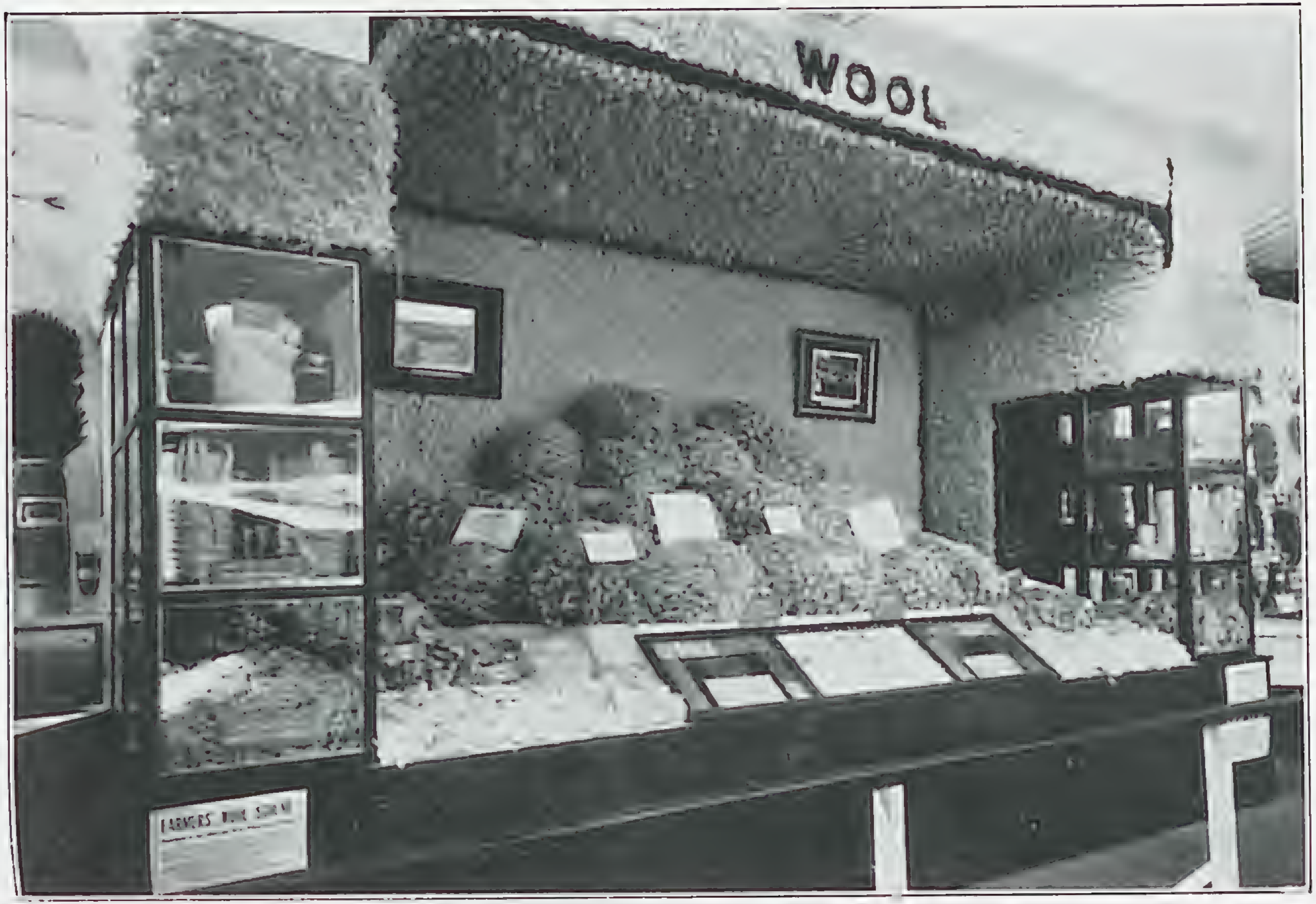


PLATE 63.—WOOL EXHIBIT, DEPARTMENTAL COURT.

The wealth of Queensland's pastures and high standards of husbandry were fitly represented in a wonderful Wool Exhibit in the Departmental Court. Side panels contained samples of textile fabrics from Queensland Woollen Mills. To-day, this State runs over 20,000,000 sheep, and our annual wool exports are worth round about £10,000,000.

Plate 64.

A Popular Verdict was given on the Evidence and the Appeal. Fleeces from Queensland Flocks.

This fine display of wool was arranged by Mr. W. G. Brown, Sheep and Wool Expert, formerly of the Department of Agriculture and Stock, for the Royal National Association.

QUEENSLAND'S GREAT SUGAR INDUSTRY.

DISPLAY BY THE BUREAU OF SUGAR EXPERIMENT STATIONS.

The varieties of cane exhibited by the Bureau of Sugar Experiment Stations included varieties from Hawaii, Java, India, Mauritius, and Queensland. The Queensland canes included new varieties raised from seed at the Sugar Experiment Station at South Johnstone. Up to the present many thousands of these seedlings have been raised, but many of them, of course, are weeded out in the process of selection. Commercial trials of the best of them are now being undertaken, also experiments as to their disease-resisting qualities. Before any cane varieties are allowed to leave the Experiment Stations they have to pass chemical and commercial trials through plant, first ratoon, and second ratoon crops. Each variety is tested not less than four times in the course of the sugar season, so that records are obtained giving farmers and millowners information as to whether canes are early or late, and as to whether their sugar contents are sufficiently high to warrant their adoption. This is combined with agricultural trials in the field, so that it may be determined whether such varieties are good croppers. They are further keenly watched for evidence of disease, and no affected canes are allowed to go into distribution. Information of this kind could only otherwise be secured by growers and millers at the cost of much time and money, and the rejection of many useless canes by the mills, which would be accompanied by severe loss to the growers.

Full descriptions of the varieties exhibited appeared on the cards attached to the canes, which also give commercial cane sugar content. Many of these canes are at present undergoing chemical and field tests, while others have passed the probationary period and have been distributed to canegrowers. These varieties, however, comprise a very small part of the number of new and tested canes that have been distributed from the Experiment Stations during the past twenty years.

Sugar-cane Propagation.

The Sugar Experiment Station at South Johnstone, near Innisfail, has, during the past seven years, been engaged in raising cane from the seed found in the arrows. This requires the utmost care, as the seed is very minute and has to be most carefully handled. Specially prepared boxes of soil are used, which have previously been sterilised. The cane arrows, when mature, are gently broken off, spread over the soil, watered, and then covered with glass plates. When germination takes place, a large number of minute shoots like grass appear. When these have made further growth they are carefully pricked out into pots or boxes, and are ultimately removed to the field. Several of them which were taken from Badila cane have Badila characteristics, and it is trusted that a cane equal to the Badila will be discovered.

Work of the Sugar Bureau.

The work of this Bureau is divided into four divisions—viz., Soils and Agriculture, Pathology, Entomology, and Sugar-mill Technology—each with a research officer in charge, and a staff of trained assistants. The headquarters of the Bureau is in the Department of Agriculture Building in Brisbane. The recently completed chemistry and pathology laboratories are located here, and these are well equipped and up-to-date. The research activities of the two former divisions are carried out in these laboratories.

Three experiment stations are located in the important sugar areas of the State—one each at South Johnstone, Mackay, and Bundaberg. These are maintained for the purpose of carrying out field experiments on soil treatment, fertilisation, and varietal trials. The stations are also provided with chemical laboratories, equipped for routine, soil, water, and cane analyses.

The Soils and Agricultural Division also controls the extension service. Field officers are suitably located throughout the cane areas, and they keep in close touch with the growers, to advise on any matters pertaining to cultural treatments and pest and disease control. Further, these officers lay out and supervise cultural and varietal trials on chosen farms, so that the exact requirements of individual soil types and climatic conditions may be determined. In the course of the past season nearly seventy such trials were set out.

The Pathology Division has, at present, officers both in the field and in the laboratory, studying the characteristics of and possible control measures for the major cane diseases.

Entomologists are maintained at selected locations so as to be able to deal most effectively with the study and experimental control work of the most important cane pests. The main laboratory is situated at Meringa (near Cairns), so as to serve the far

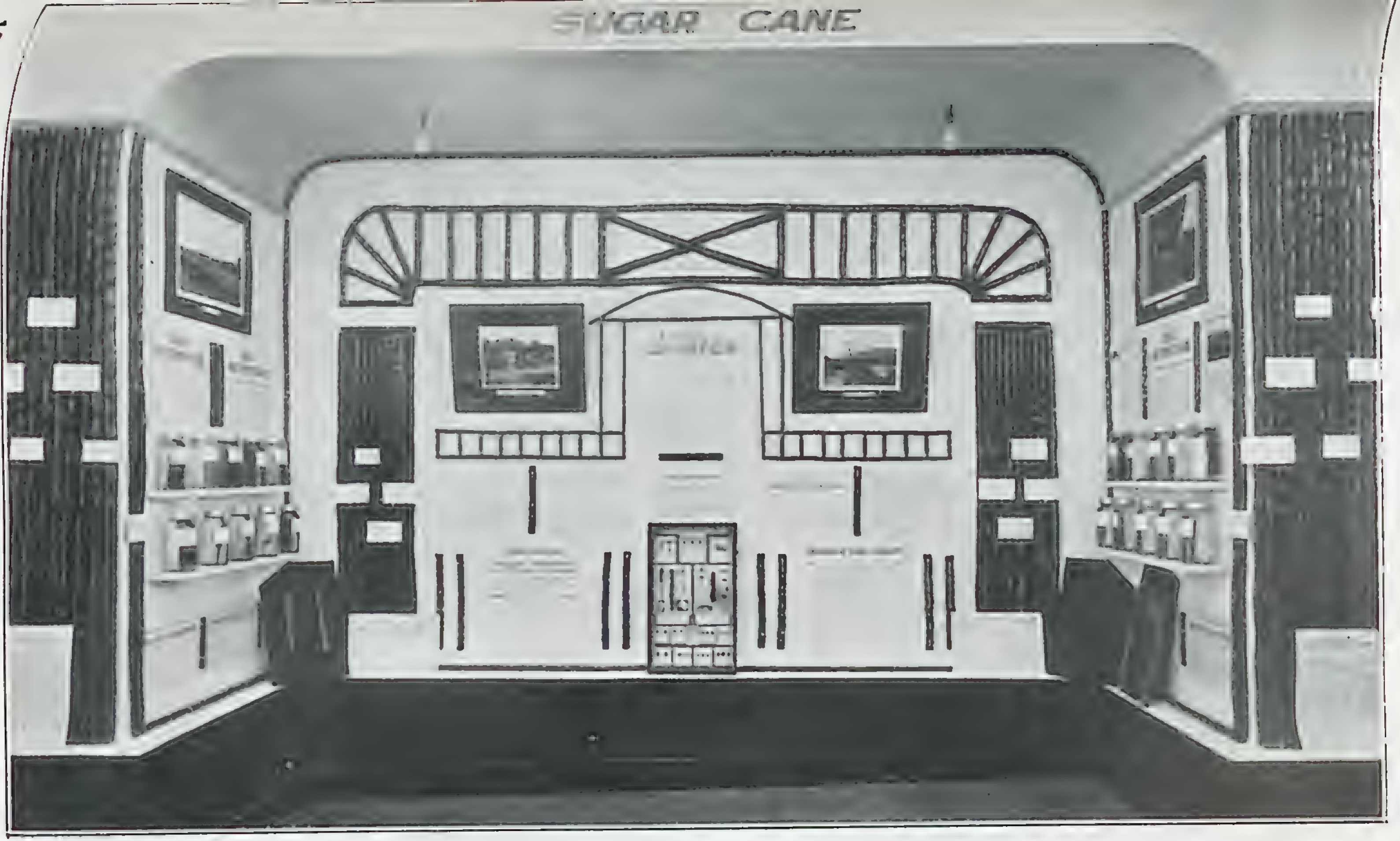


Plate 65.—A White Man's Industry in a White Man's Land.

The Cane Alcove in the Court of the Department of Agriculture was a very attractive representation of an industry carried on successfully by White Australian Workers in field and factory, and which is worth well over £10,000,000 a year to the Commonwealth. Sugar growing is this State's leading agricultural enterprise, and in this bay of the Court the farm and laboratory activities of the Bureau of Sugar Experiment Stations were strongly illustrated.

19

Northern areas, where pest damage is most serious. An entomologist is also located at each of the experiment stations of Mackay and Bundaberg.

The division of Sugar-mill Technology was recently initiated, and is now in the process of organisation. With a well-equipped laboratory at Mackay, the technologist and his staff will investigate the problems pertaining to the various phases of sugar extraction and manufacture.

In all, there are twenty-three officers on the Bureau staff, and the organisation covers the several phases of cane production and manufacture in a manner quite unique amongst the primary industries of Australia. The funds for the maintenance of the Bureau are contributed equally by the industry and the Government.

Economic Value of Cane Cultivation—Its National Significance.

The work of the Sugar Experiment Stations, in relation to the promotion of the agricultural welfare of Queensland in connection with the sugar industry, cannot be over-estimated. When it is considered that this industry is the greatest agricultural one in Queensland, and will produce over 500,000 tons of sugar this year, estimated to be of the value of about £10,000,000, it can be seen how highly necessary it is that it should be assisted and encouraged in every possible way. Apart from its economic value, however, it has a deep national significance, and has already played a very large part in peopling the North.

Rainfall.

The Queensland rainfall, fortunately, is highest during the summer period, at which time the cane plant makes its maximum of growth. The following are average rainfalls in the principal sugar-growing districts:—Cairns, 92.65; Johnstone River, 160.88; Herbert River, 84.91; Mackay, 66.67; Bundaberg, 44.40. Cane grows best when the relative humidity of the atmosphere is high, and this is the case during the wet season in Northern Queensland.

Production and Prospects.

Queensland's sugar production in 1867 was 338 tons, and in 1928 reached 520,000 tons, the record crop to date.

The yield of cane and sugar per acre is improving, due to better methods of cultivation and growth of superior canes. The mills have also largely increased their efficiency, and over £2,000,000 have been spent during the past five years in improving existing mills, while, in addition, the Queensland Government have the most up-to-date sugar plant in Australia in the Tully River district.

Queensland is by far the largest sugar producer in the Commonwealth, manufacturing about 96 per. cent. of the total output. The sugar-fields stretch along the north-eastern coast of Australia (with some intervals of poor land with deficient rainfall), from the border of New South Wales to Mossman in the Cape York Peninsula, The total acreage under cane is now about 290,000. It is, therefore, the largest agricultural industry in Queensland.

To deal with the cane supplied from this acreage there are thirty-five sugar-mills in operation. Each mill has a system of 2-feet tramways radiating to the surrounding farms for the transport of cane to the mill, while all the mills are connected by rail to the nearest seaport, the manufactured raw sugar being shipped away to the refineries at Bundaberg, Brisbane, Sydney, Melbourne, Adelaide, and Perth.

Progress in the North.

One of the most marked features of the sugar industry in recent years has been the great progress made by the sugar districts north of Townsville. In 1910 the sugar-mills beyond Townsville produced 57,135 tons of sugar, while in 1928 the production in this area reached 255,188 tons from ten mills, while the twenty-five mills south of Townsville produced only 265,432 tons. This has been due to the opening up of fine sugar lands in the rich rain-forests of Babinda, South Johnstone, and Tully, and the development of the older lands at Cairns and Ingham, by providing more capacity at the existing sugar-mills.

The opinion held by medical men is that the white man can lead a healthy life and rear a vigorous family in tropical Queensland.

The Cane Alcove in the Court of Agriculture contained information and illustrations relating to the whole sugar industry from the first cultural operation to the last refining process.

DAIRYING.

The Dairy Exhibit was a comprehensive one with a strikingly original arrangement. Milks, cream, granulated butter, and butter were exhibited; also cheese in its various stages of manufacture. By-products, such as casein, dessicated milk, milk powder, were also strongly in evidence. Herd testing in all its detail and bacteriology as it applies to dairying was given prominence.

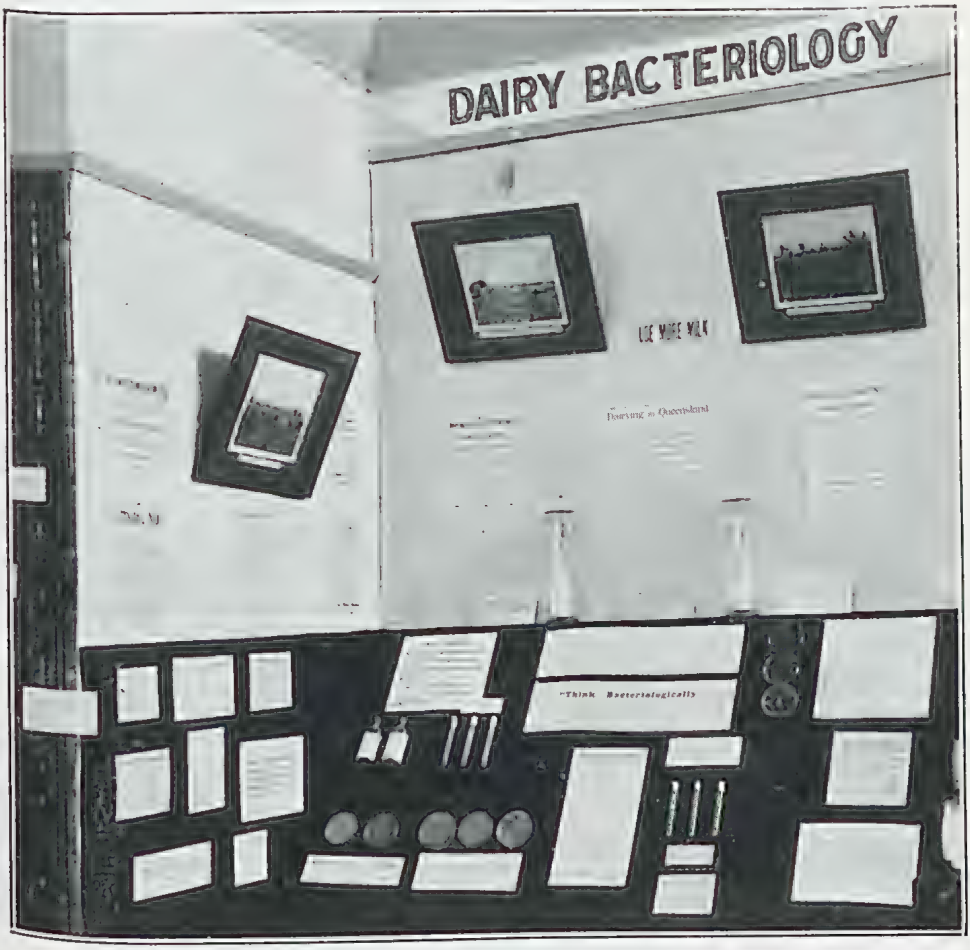


Plate 66.—Milk and Microbes.

That there should be no synonymity in this term was demonstrated most effectively in this corner of the Court. The necessity of scrupulous cleanliness in the milking-shed and dairy was impressively illustrated.

The central idea of the display was based on the food value of milk. An imitation bottle, 6 feet high, set out with an appropriate background, formed the centre of the trophy, around which pasteurised milk, in bottles of varying sizes, were placed in such a way as to emphasise strongly this method of milk delivery.

A number of slogans urging the value of milk and its products completed a very fine display that won popular commendation.

PLATE 67.—MILK FOR THE MULTITUDE.

Dairying is a great and rapidly expanding industry in Queensland, one fourth of the total Butter output of the Commonwealth and almost half of the Cheese out-turn are produced from Queensland's pastures. Its annual value is approximately £7,000,000.

POULTRY RAISING.

The exhibit of the Poultry Branch, as in previous years, was of outstanding interest. A feature of the display was the variety of poultry farm requisites, and in designing these consideration was given to simple and cheap methods of construction and maintenance of efficiency. In keeping with the present over-production of eggs in comparison to local consumption the trap nest was shown, illustrating that by its use the poultry farmer is able to produce eggs at a much lower cost. The demands of the industry at present are that eggs must be produced cheaper, and by the installation

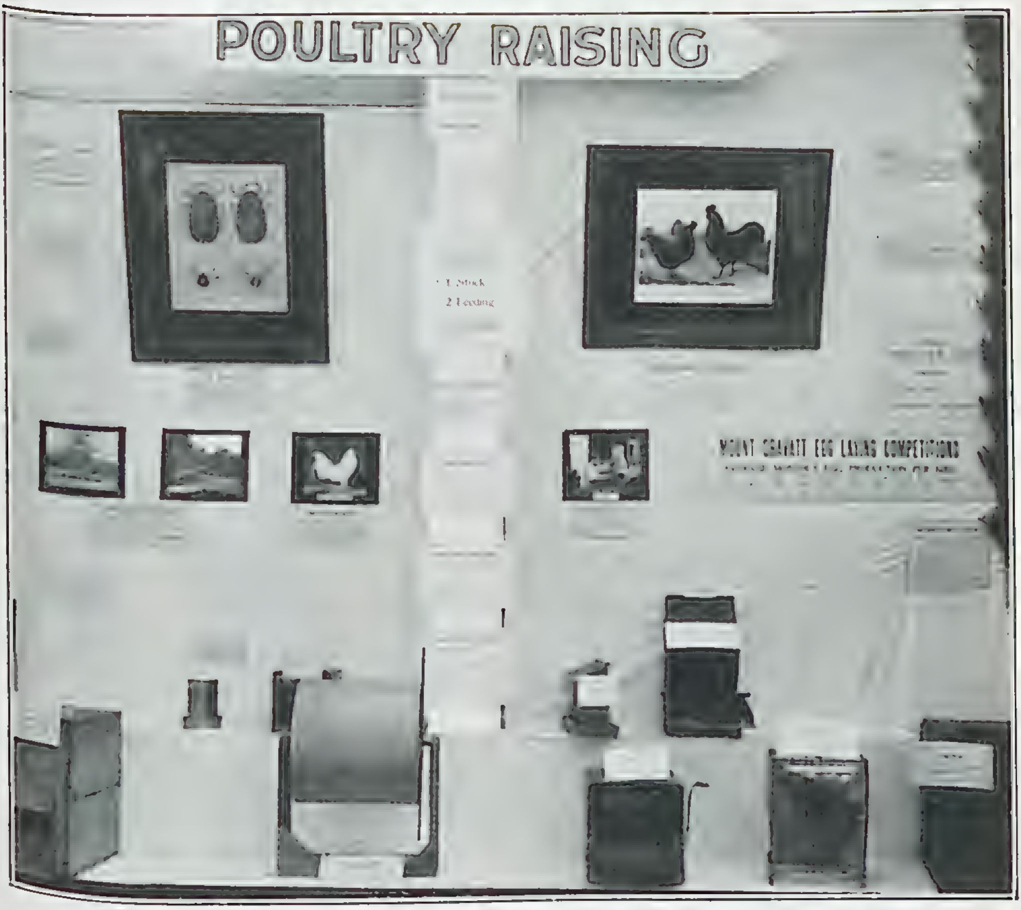


Plate 68.—The Poultry Panel in the Agricultural Court.

This display illustrated the educational work of Departmental officers in a rapidly expanding and valuable Queensland industry returning nearly £1,000,000 annually to the State.

of the trap nest the poultry farmer is able to locate non-layers, and these can be culled, thereby increasing the average egg yield in relation to the quantity of food consumed. The trap nest is also an aid to flock improvement, for by its use the best layers can be selected for breeding purposes.

Numerous practical examples of breeding, feeding, housing, and other phases of poultry raising were displayed. These were really pointers to success in poultry keeping.

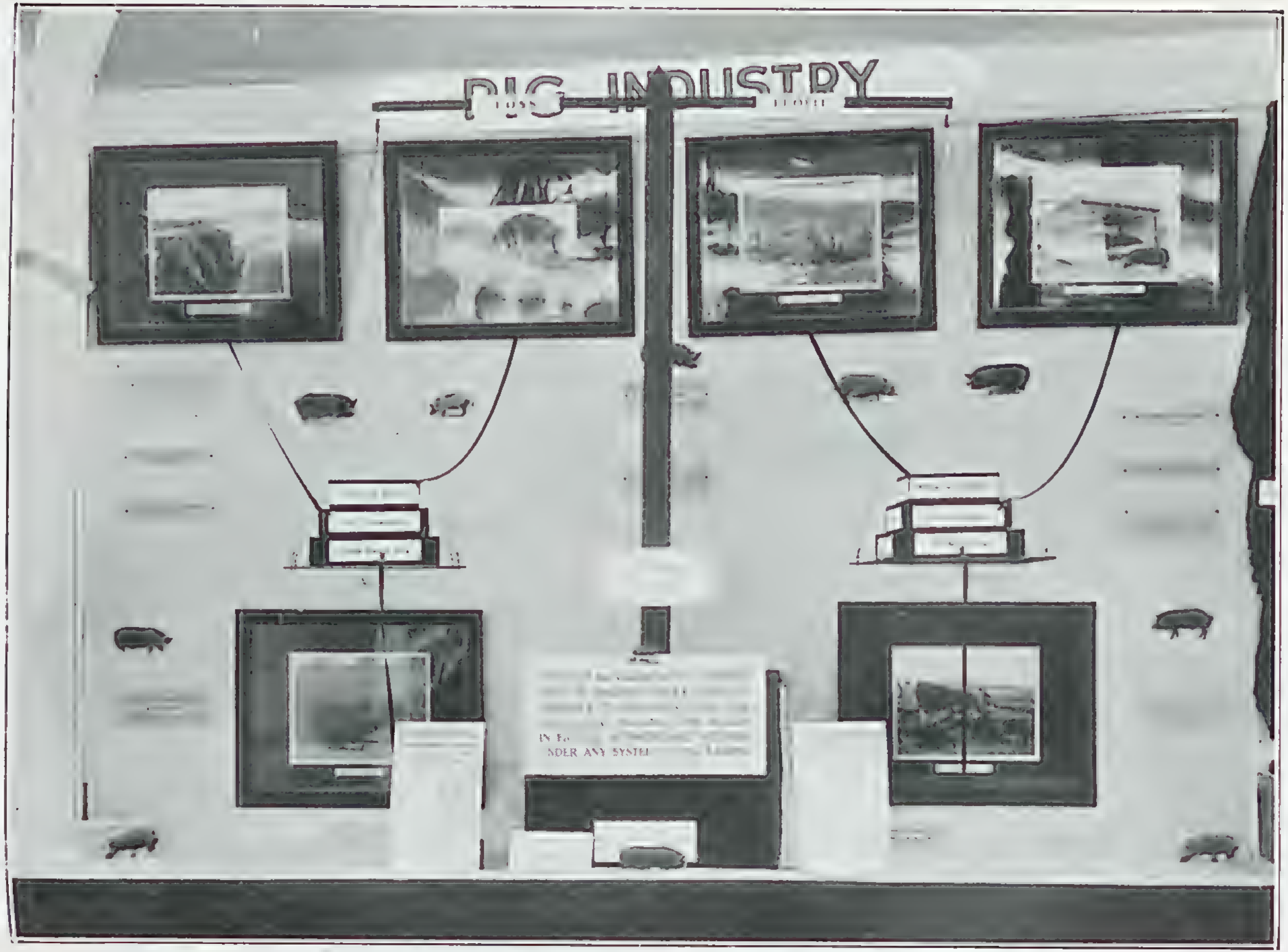


PLATE 69.—A BALANCED INDUSTRY.' PIG EXHIBIT, DEPARTMENTAL COURT.

Pig raising in Queensland is rising rapidly in importance as a staple industry. Throughout the year an active educational campaign is carried on by the Department of Agriculture and Stock, and this panel illustrated the nature and value of that work.

PIG RAISING.

The pig-raising activities of the Department were strongly illustrated by trophy and illuminating legend.

A gigantic set of scales, balancing profits and losses and the factors governing both, made up the central feature; thus good breeding, feeding, careful management, suitable environment, and judicious control were weighed against neglect, improper breeding, faulty feeding, and unhealthy surroundings.

At the Pig Section buildings, the display of a miniature model farm piggery was a special feature. This had been prepared with the object of providing fresh ideas for the practical layout of accommodation for the pigs. Pig raising is essentially a farm foods feeding proposition, hence the production and utilisation on the farm of the necessary food supplies must be the principal aim of the farmer. This necessitates the provision of cultivation paddocks, grazing areas, and suitable and sufficient paddock accommodation to enable the pigs to be kept in the open air as much as is possible in preference to being continuously housed.

This model of a farm piggery provided not only for cropping areas and for succulent pasture, but also for a satisfactory type of shelter-shed, portable or otherwise, such as is adapted for use in the open-air system of pig raising. Provision was also made for concrete feeding floors and troughs, oiling posts, movable hurdles, netting fences, and drafting yards. The fences, gates, and hurdles were of a type suggested as suitable for the pig farm.

Various cuts of bacon in normal and abnormal condition were displayed with the object of stressing the loss associated with the improper handling of pigs in the fattening and marketing stages. The industry suffers appreciable losses each year through the supply of pigs in an overfat condition and through bruising and damage of carcases in transit.

In the Pig Section were representative animals of the following breeds:—Berkshire, Middle Yorkshire, Tamworth, Poland-China, Gloucester Old Spot, Duroc-Jersey, Large Black, Chester White, pork and bacon pigs. There were also exhibits in the litter weight classes and a display of pigs from the Pig Breeding Experiments at the Gatton College. The pigs were housed under modern conditions.

CEREAL CROPS.

It was a happy idea having the Sheep and Wool, Dairying, Pig Raising, and the Poultry exhibits in proximity to those of Wheat, Barley, Oats, and Maize in the Departmental Court. This arrangement served to emphasise the interdependence in quite a number of ways of these several important industries. The function of a Department of Agriculture, however, is to demonstrate how production may be increased, and the quality of individual products not only improved but maintained.

An examination of the work of officers of the Department through the medium of the exhibits showed that they have tackled their problems in the only way that a scientist can approach them—i.e., by getting down to fundamentals. One striking point in this display was the improvement manifest in the type and quality of grain wrought by the individual breeders of wheat and maize. This branch of research calls in the first place for a natural aptitude and love for such work and, secondly, for vision in respect to its accomplishment. Both attributes were abundantly obvious. Interesting information of various kinds was given regarding each individual industry.

Special attention was bestowed on plant breeding, seed selection, and the production of seed for distribution, to the description and treatment of plant diseases, and to the principles of cultivation and to experiments with fertilisers. Particulars are summarised of a series of fertiliser tests with wheat carried out over a term of fifteen years at the Roma State Farm were set out, and it was of interest to note that up to the present the manuring of the crop on this particular farm has not proved an economic proposition. The inference may be drawn that the conservation of soil moisture and approved methods of cultivation exercise a more direct bearing on yield than that of artificial fertilisers.

Similar remarks may be applied to the fertiliser experiments with maize on the red volcanic soils at Kingaroy, as the results of two seasons' work, were clearly shown on charts exhibited. In the 1928-29 series there were 144 plots, these being protected by buffer areas. Seventy-two plots were fertilised, and there were seventy-two unfertilised plot controls. Each fertilisd plot was surrounded with controls.

PLATE 70.—THE STORY OF THE OPEN DOWNS IN SHEAF, GRAIN, AND VALUABLE DERIVATIVES.

PLATE 71—CEREAL DISPLAY, DEPARTMENTAL COURT.

These two panels told an impressive "Cereal Story" of the progress and development of the great grain lands of Queensland. They demonstrated the success of Departmental Wheat and Maize breeders in the evolution and fixation of varieties and types that have quadrupled our grain yield. The examples shown were bred at the Roma State Farm and grown in different parts of the Darling Downs.

There were six mixtures of fertilisers, and each test was replicated twelve times. The results were negative in character, and there was little or no difference between the yields of the fertilised and unfertilised plots, details of which are as follows:—

Total weight of ears from seventy-two control plots (1.44 acres) = 5,937 lb. = 60.37 bushels per acre.

Total weight of ears from seventy-two fertilised plots (1.44 acres) = 5,987 lb. = 60.87 bushels per acre.

In the 1929-30 series there were 132 fertilised and twelve control plots surrounded as before by a buffer area. Eleven mixtures were used, and each was replicated twelve times, the plots being randomised.

These plots were only recently harvested. Final details have not yet been worked out according to the students' method of calculation.

Taking a bare comparison, however, which is not to be regarded as final, this determination shows the approximate yield to be as follows:—

Total weight of ears from twelve control plots = 357½ lb. = 42.5 bushels per acre.

Total weight of ears from 132 fertilised plots = 4.144 lb. = 44.8 bushels per acre.

Highest average yield was obtained from PsK mixture (twelve replications)—viz., 47.3 bushels per acre.

Average yield from controls (twelve unfertilised) = 42.5 bushels per acre.

Cost of fertiliser (PsK mixture), £1 5s. 10d. per acre.

A small exhibit was staged of the Giant Morocco variety of canary seed, which was propagated by the Department for the express purpose of distributing improved seed to growers. The importation of canary seed to the Commonwealth has now ceased. A pool was formed last year to permit of the product being marketed on a co-operative basis, and a strong effort is being made to grow sufficient canary seed on the Darling Downs to meet Commonwealth requirements.

ENTOMOLOGY.

The work of the Division of Entomology and Plant Pathology was again represented by an extensive display dealing with the more important insect pests and diseases affecting Queensland crops.

The exhibit staged by the Entomological Branch of this Division consisted mainly of a series of life-history cases demonstrating by means of coloured drawings and actual specimens the history and habits of the insects causing serious loss in fruit, vegetables, grain, and other crops. There were also cases dealing with stock pests, such as the blow fly and the cattle poisoning saw fly, which was of special interest to the pastoralist.

Of exhibits of more special interest at the present there were specimens of the banana insect pests, including the banana weevil borer, the banana thrips, the spotting bug, and the fruit-eating caterpillar. Citrus pests were dealt with in one large case supplemented by a separate presentation of the spiny orange bug. A number of vegetable pests, including the cabbage moths, bean fly, potato tuber moth, and the corn ear worm of tomatoes, were displayed in an interesting way. Of special interest to most Queenslanders was a case presenting a study of the prickly-pear destroyer, *Cactoblastis cactorum*. The water-colour drawings, which formed a conspicuous feature of this display, were the work of Messrs. I. W. Helmsing, E. Jarvis, and H. Jarvis.

Plant Pathology dealing with the fungus and bacterial diseases of crops was represented by a series of preserved plant specimens, illustrating most of the commoner diseases of fruit, vegetables, and cereals. Jar specimens were supplemented by coloured illustrations of the various maladies. The several diseases of the banana, citrus, pineapples, and tomatoes were dealt with in particular detail. Bunchy top of the banana was well represented by means of a living affected plant and by photographs. Among other well-known diseases displayed were black spot and melanose of citrus, Irish blight of the tomato and potato, water blister of pineapples, and the common wheat smuts.

The Entomological display was arranged by Mr. J. A. Weddell, while the Plant Pathology section was in the hands of Messrs. R. B. Morwood and L. F. Mandelson under the supervision of Mr. J. H. Simmonds, Plant Pathologist.

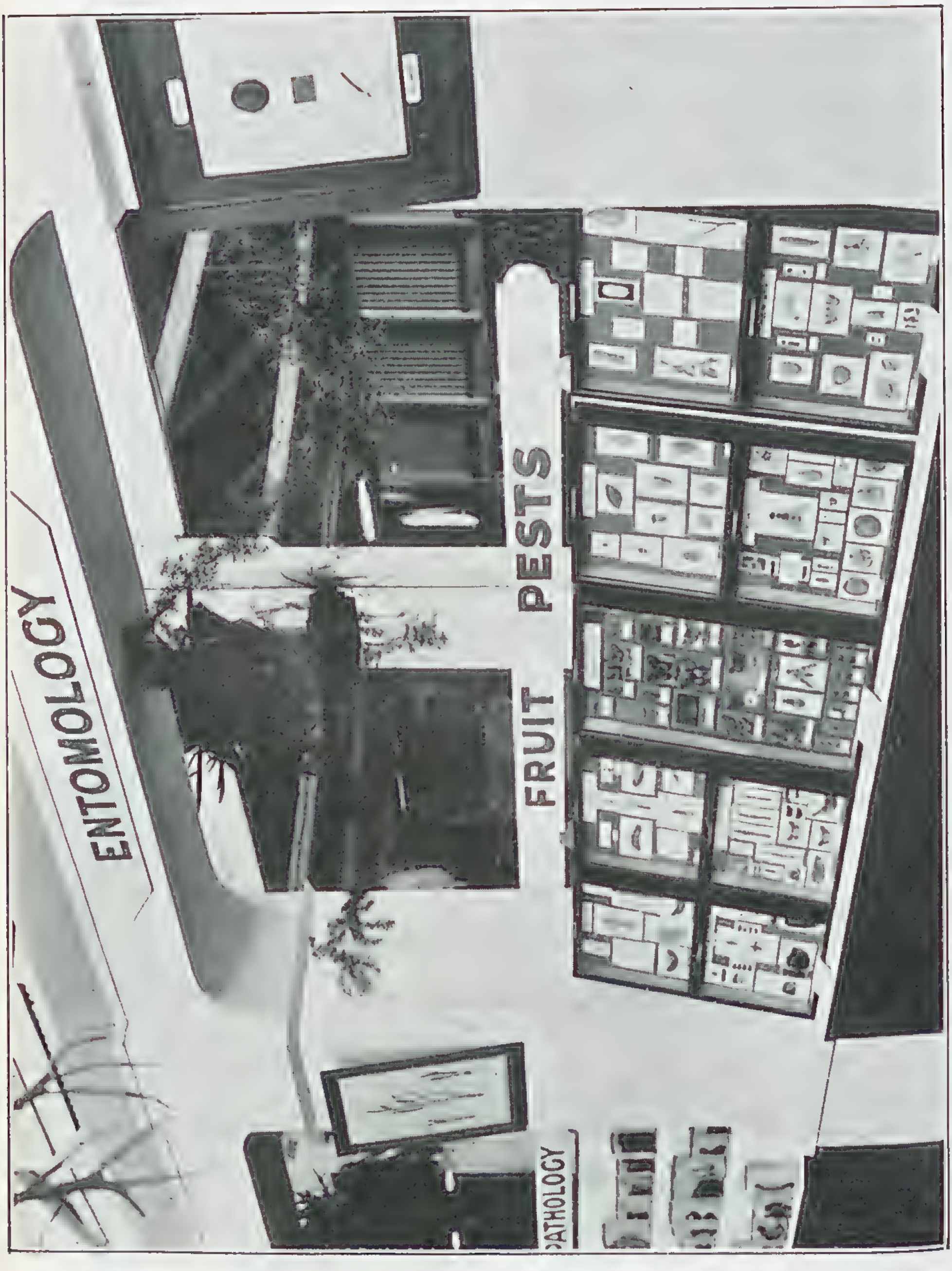


PLATE 72.—FRUIT PESTS EXHIBIT, DEPARTMENTAL COURT.

This and associated annexes in the Departmental Court illustrated the investigations of the Scientists who, in Queensland, work in double harness with the primary producer.

PLATE 73.

A PANEL IN THE DEPARTMENTAL COURT, ILLUSTRATING THE SERVICE OF SCIENCE TO THE FARMER.

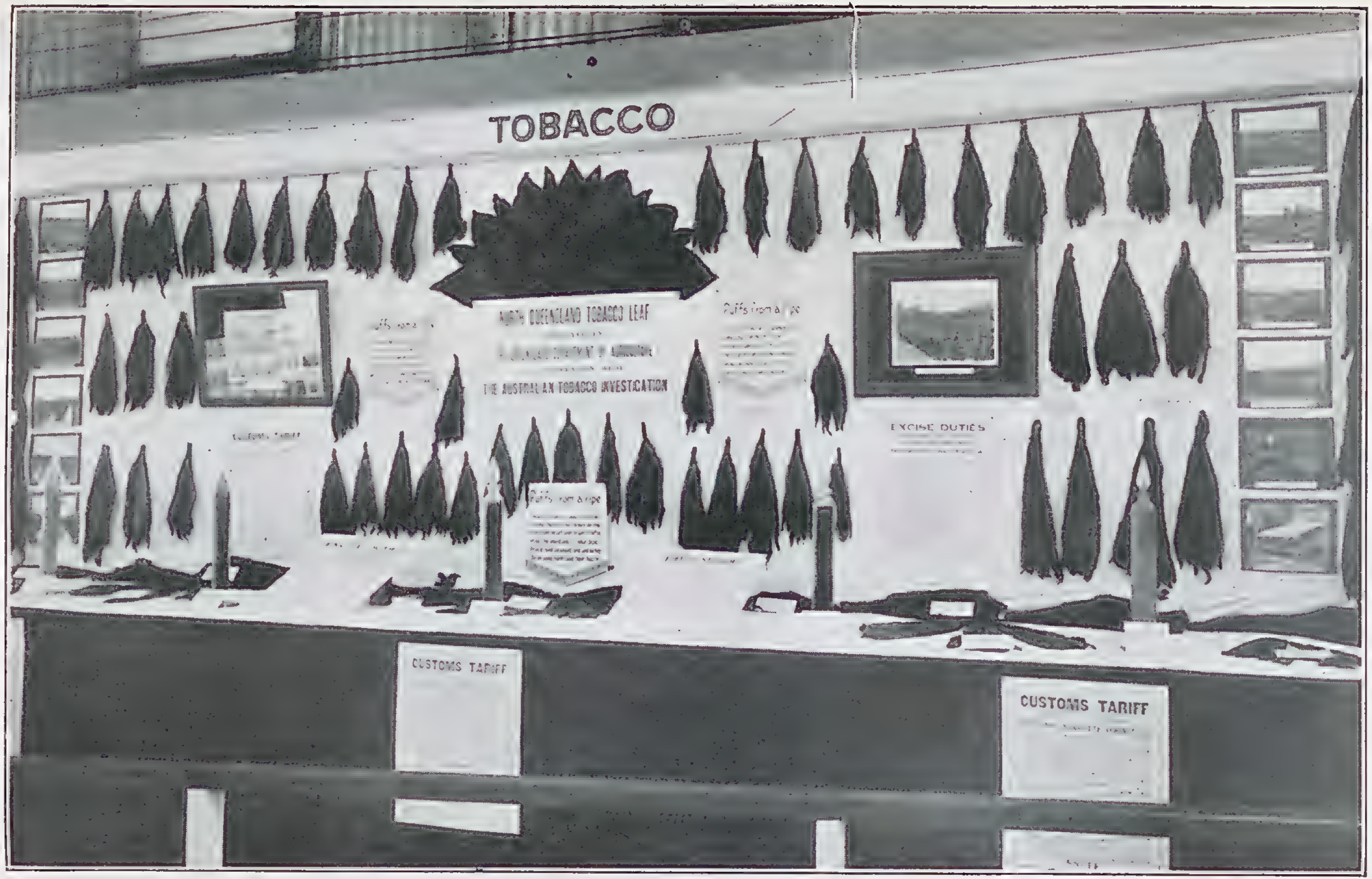


PLATE 74.—QUEENSLAND-GROWN TOBACCO.

This panel in the Departmental Court illustrated the revival in tobacco growing in this State. Leaf produced in North Queensland was recently described in evidence before the Federal Parliamentary Select Committee on Tobacco growing as the best yet produced in the Commonwealth.

TOBACCO.

In view of the increasing interest manifested in Australian tobacco production, the exhibit of tobacco leaf produced in several districts of North Queensland, displayed by the Queensland Department of Agriculture in co-operation with the Australian Tobacco Investigation, attracted a large measure of attention.

Tobacco leaf produced in North Queensland was recently described in evidence given before the Federal Parliamentary Select Committee on Tobacco Growing as the best yet produced in the Commonwealth, while the statement was also made that it was considered possible to obtain from crops grown on certain types of North Queensland soils upwards of 90 per cent. of bright-coloured leaf when flue-cured.

The satisfactory prices, ranging up to 3s. 8d. per lb. according to grade, from the manufacturers for commercial lots of leaf produced in the Townsville, Charters Towers, and Pentland districts, respectively, last year, together with the indication from the purchasers that further lots of similar and better quality would be readily purchased, suggest, especially in view of the increased duty on imported leaf now operating, that tobacco leaf production on suitable soils in North Queensland will prove extremely profitable, and in the near future become an industry of great importance.

The exhibit comprised examples of flue-cured bright tobacco leaf produced in the Mareeba, Ingham, Townsville, Pentland, Bowen, and Mackay districts, respectively, and also examples of air-cured leaf of the White Burley variety produced in the Townsville district.

While bright tobacco varieties are grown on light-textured soils of low fertility, to which fertiliser is added in quantity sufficient to secure moderate leaf development and flue-cured, the White Burley variety is grown on rich soil in order to secure large leaf development, and is air or fire cured. The former is appreciated for mild cigarette and pipe tobacco, while the latter is valued for pipe smoking or for blending in pipe and cigarette mixtures.

Grades of leaf of both flue and air cured types were shown with cards denoting their respective uses in manufacture.

Enlarged photographs depicting crops of tobacco, transplanting young plants, harvesting ripe leaf and other features of production, served to enhance the attractiveness of the display, while tables of statistics relating to Australian manufacture, importations and Customs duties indicated the importance of the industry and the extent of its possible development.

COTTON.

The cotton exhibit this year was arrnaged so as to afford a slight idea of how a field of cotton in full maturity appears. In conjunction with this fine central feature, illustrations explaining the methods adopted by the Departmental officers in the breeding work connected with developing varieties of cotton suitable for Queensland conditions were displayed.

Examples of the standards for grades of seed and lint cotton which are used in valuing the growers' crops when they arrive at the ginnery and prior to the sale of the bales of lint were also on view.

A comprehensive range of by-products obtained from the cotton seed was also presented so as to illustrate more fully the economic value of the crop to Australia generally. Fuller information on this and other phases of the cotton industry accompanied the various sections of the exhibit.

PLATE 75.—COTTON WAS KING.

A field of cotton surrounding a new selector's home was the central feature this year in the Court of the Department of Agriculture and Stock. This year Queensland will pick about 10,000 bales, and the industry is as yet in its rudimentary stage. Projected spinneries will provide a home market for Queensland's "white hope."

Plate 76.—The Vice-Regal Escort. Troop of Queensland Mounted Police.

The Queensland Mounted Police is composed of expert horsemen, and is noted for its very high standard of efficiency. The horses were bred at Rewan, the Government Remount Station in Central Queensland.

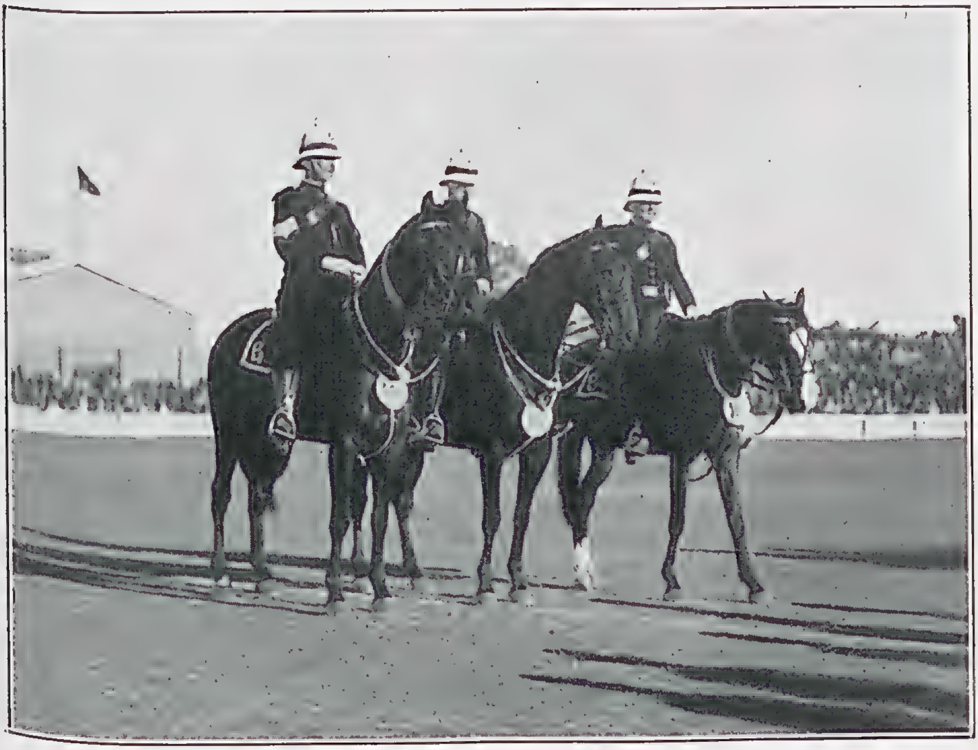


Plate 77.

Queensland Police Horses, representatives of the famous "Waler" type, so popular as cavalry charges in Imperial and Dominion Armies.

DAIRY CATTLE AT THE SHOW.

EVERY year adds to the number of entries representing a splendid class of dairy stock, bred by careful breeders, who, from year to year, have added to the great wealth of the State. There is no doubt that the breeders have not only risen to the importance of producing first-class animals, but have focussed their attention on obtaining tip-top sires, a reflex of careful culling. The long term of winter rains, no doubt, robbed many of the stock of their bloom, and this was frequently commented upon by keen observers. There was, however, a remarkable assemblage of high-class dairy stock, and the judges in all the leading classes had a most difficult task. Hundreds of well-known breeders were present from the sister States, and, with well-known Queensland breeders, expressed the view that to witnss such an array of high class stock was a show in itself, and, as many said, an eye-opener.

AUSTRALIAN ILLAWARRA SHORTHORNS.

Of all the breeds, the Australian Illawarra Shorthorn is the one that arouses general admiration, and at several periods of the judging the encroachment of the huge and critical crowd became so great that the stewards had to clear the "decks," and give more room to the judges. The Royal Association might, with advantage to the public, who are ever eager to learn results quickly, appoint two judges for the Illawarras and Jerseys—two classes which have gained great popularity in Queensland, both in number and quality. The judge of the Illawarras, Mr. Jos. Wills, of Kangaloon (New South Wales), took the precaution of having his son, who was present, to assist him in determining the awards. He had a huge task, and his opinion, as a well-known breeder, was one of praise for the class presented.

Cows and Heifers.

As in former years, judging of the cow, 5 years old or over, in milk, proved to be a difficult task. The reds predominated. The choice fell on Mr. J. Phillips's Myrtle IV. of Lemon Grove, and this rich red subsequently annexed the championship. Mr. A. Pickel's Jean VI. of Blacklands, also a deep red, came a good second. The section cow judging, 4 years old and under 5 years, proved to be a tedious job, and a stylish red, owned by Mr. A. T. Waters, Fussy V. of Railway View, secured the blue, while a close runner-up was Mr. J. Phillips's Evelyn of Sunny View.

In the younger set of females, however, an even keener contest was staged, and the class for a heifer, 2 years old and under 3 years, in milk, produced a splendid collection of stock. The beast to attract most attention was Mr. Pickel's Stella of Blacklands, a handsome little red, with great possibilities. In the class, heifer, 2 years old and under 3 years old, dry, there was an even contest, finality resting with Messrs. Hickey and Sons' Happy IV. of Springdale.

There was a very large entry of heifers, 18 months old and under 2 years, dry. Mr. Pickel's Foremost III. of Blacklands was well in the running, and this little aristocrat annexed first place, with Grace IV. of Greenfields second. In the heifer calf class the judge seemed to be perplexed as to where to do justice. The younger generation of show cattle often prove to be future champions, and it was evident that Dnalwon Lucky Star had a good chance, and after a searching examination secured the coveted ribbon. There was keen rivalry for second and third positions. Jean VIII. of Blacklands being placed second, with Kitty of Sunnyview third.

Of the aged cows, the champion cow, Mr. J. Phillips's Myrtle IV. of Lemon Grove, was a rich red, with a wonderful constitution, and great breeding. The heritage of this cow is a wonderful asset to the owner, and there was unstinted praise for this beautiful beast when she captured the championship sash. The reserve champion, Mr. A. Pickel's Queen VI. of Blacklands, was a beast of wonderfully true Illawarra type, and the contest was an animated one.

The Bulls.

There is no show in the Commonwealth to-day, and one might safely say in any part of the world, which can stage bulls of the class of Illawarras as were presented at Brisbane this year. The aged bulls, particularly, showed great breeding, with

fully 60 per cent. of them true Illawarra type. There were, however, quite a number presented of a rough and uncouth appearance. The aged bulls were mostly in good condition. The champion, Mr. F. O. Hayter's Daphne's Royal of Hill View, was, in every way, a fine and well-proportioned beast, with a big length and well-formed limbs. His colour denoted the origin of a dash of the Ayrshire, for he showed white spots along his flanks and sides. The reserve champion, Limelight of Gulvallis, was a rich red, and this beast has great possibilities.

The "bloom" of the older bulls was a contrast to the younger generation, and an enormous crowd witnessed the examination of the bull, 4 years old or over. In the class of bull, 3 years old and under 4 years, there was very keen competition, and it was evident that Jellicoe of Headlands had a great chance. This beast had no trouble in getting a first, with Monarch of the Valley second. It was probably in the class bull, 2 years old and under 3 years, that the keenest contest prevailed, and there appeared to be a healthy rivalry between Mr. J. A. Montgomery's Renown of Mountain Home and Messrs. A. J. Caswell's and Franklin's Limelight of Raleigh. The choice fell on Renown of Mountain Home, a well-grown and stylish red.

In the younger classes strict culling was the order, and it was evident that the condition of the young bulls had a determining effect on the judgment.

The Groups.

The showing of groups and the progeny of breeders gave to the public an exhibition of what a dairy herd is like, and during the judging various expressions of opinions were voiced by onlookers, whose verdicts were in sympathy with the judge's decisions. In the breeders' group, Mr. A. Pickels came first and Mr. J. Phillips second. The exhibition groups also showed that Mr. A. Pickels was first and Mr. J. Phillips second. In the progeny stakes Messrs. Hickey and Sons secured first and Mr. A. Pickels second.

THE JERSEYS.

The Jerseys were fully representative of this wonderful breed, and around the ring was a large crowd of interested spectators. The judge was Mr. D. Walters, of Randwick (New South Wales). The decisions generally met with approval. In a brief chat the judge stated that the standard of the Jerseys was not up to that of previous years. It is evident that breeders of this class will require to cull rigidly, and acquire a habit of securing the very best class to breed from. The champion Jersey cow, Messrs. E. Burton and Sons' Oxford Golden Buttercup, was a faultless animal, and the breeders, who are well known throughout the Jersey world, should feel proud of such a bonny beast. This cow also annexed the blue ribbon as a four -year-old, in calf or dry. The reserve champion, Messrs. W. Spresser and Sons' Lucy's Pocket, was an equally attractive animal, and was favourably commented upon. She was placed first in her class, cow, 5 years old or over, in milk. For cow, 3 years old and under 4 years, in milk, a keen contest raged. In this class Messrs. E. Burton and Sons' Oxford Daffodil won a merited first, with Trinity Columbine second. The section heifer, 1 year old and under 2 years, in milk, which was a very heavy class, proved to be one of the most interesting of the day. They were a very pretty lot of animals, and were generally in good condition. Mr. E. Burton's Oxford Aster came first, with a close runner-up in Messrs. Spresser and Sons' Lockit's Pride. In the heifer, 18 months old and under 2 years, there was healthy rivalry, and Oxford Dianthus stood gracefully while the blue ribbon was being placed, and Mr. P. J. O'Shea's Middenbury Golden Lass was rather happy at securing second position.

The Bulls.

The Jersey bulls of the aged class looked well, although some were presented in a rather ungroomed condition. The champion bull, Mr. W. W. Mallet's Trinity Darby (awarded the championship at the 1929 show), was a beast worthy of the best traditions of the breed. The reserve champion, Mr. T. A. Petherick's Trecarne Golden King, is a splendid sire. In the class for bulls, 2 years old and under 3 years, Messrs. Matthew Bros.' Trinity Goodwin had little trouble in securing first place, with Mr. B. J. Jensen's Kelvinside Noble's Chieftain a well-merited second. In the younger classes of bulls there appeared to be a "tail," and culling by the judge was noticed. In the class of bull, 18 months old and under 2 years, Mr. J. Williams's

Trinity Armlet won. For bull, 12 months old and under 18 months, Trecarne Renown was successful, after a very keen contest. The breeders' and sire and progeny groups proved an exhibition of great interest.

THE AYRSHIRES.

As a utility dairy breed it is difficult to find cattle to excel the Ayrshires, and great interest was displayed in this attractive class. The judge, Mr. J. A. Bond, of Dandenong (Victoria), was a very careful adjudicator. Mr. Bond was impressed generally with the Ayrshires presented, and his remarks concerning the champion bull were certainly encouraging. His opinion of the champion cow and bull was that they would command attention in any show ring. The champion Ayrshire cow, 3 years old and under 4 years, in milk, was Messrs. J. H. and R. M. Anderson's Fairview Lady Jean, a rich brown and white beast, with all the attributes of a great milker, and of healthy appearance. The reserve champion was an equally attractive animal, Mr. G. Norgaard's Tina IV. of Longlands. This great animal is possessed of very fine proportions, and bears evidence of great breeding. The same beast gained first place in her class as cow 4 years old or over, in calf 6 months, or dry. In the section of cow, 3 years old and under 4 years, in calf, Messrs. J. H. and R. M. Anderson's Fairview Hannah gained first place, with Stimpsons Ltd. Elersley a well-merited second. The younger females were in small numbers, and were in fair condition, especially cattle from the Downs, which had apparently been running on the wheat fields. The group of three heifers, under 3 years, was an attractive lot, and Mr. Thomas Holmes secured first place, with Messrs. J. H. and R. M. Anderson a good second.

The Bulls.

The aged bulls were a presentable lot, and were mostly in good condition, although possessing a want of bloom. For a bull, 4 years old or over, Messrs. J. H. and R. M. Anderson's Longlands Bonnie Wilk gained first, and at a later period was crowned champion. The reserve champion, Mr. Thomas Holmes's Claredale Bonnie Billy, was an upstanding animal, with a wonderful appearance. In the class of bull, 2 years old and under 3 years, Stimpson's Eleresley Grand was placed first, Mr. G. Norgaard's Holm Park Baden came second. The groups of Ayrshires were splendid specimens, and the breeders' group was in every way indicative of the advance which has been made in recent years. The award in this class was won by Messrs. J. H. and R. M. Anderson, with Stimpsons Ltd. second. For the breeders' junior group, Mr. Thomas Holmes came first, with Mr. J. C. Mann second. The exhibitors' group was won by Messrs. J. H. and R. M. Anderson.

THE FRIESIANS.

The Friesians created interest, and this big-boned class of dairy stock appear to be holding their own. The judge, Mr. P. C. Pryce, of Toogoolawah, stated that the breed was in every way sustained, and the class of cattle placed before him were a very creditable lot. In the section, cow, 4 years old or over, in milk, Messrs. Hickey and Sons' College Princess Pontiac won first prize, and in the cow, 3 years old and under 4 years, in milk, the same breeders annexed a first with Stoneybrae Wallflower. In the cow, 4 years old or over, in calf, Messrs. David Young and Sons came first with Inavale Shield. The champion Friesian cow was an upstanding beast, possessing great bone and length. Messrs. Hickey and Sons' College Princess Pontiac gained the coveted champion sash, with Mooloombin Pontiac Girl reserve champion. The younger females were poorly represented.

The Bulls.

It was probably in the Friesian bulls that the chief interest was manifested, and the judge, in placing the champion ribbon on Messrs. David Young and Sons' Colossus of Stathan, was on safe ground, as this animal possessed in a marked degree the characteristics of the breed. The reserve championship went to Mr. W. H. Gram's St. Athan Actuary, a descendant of Pier Rock, a beast known years ago in the show ring. The exhibitors' group was won by Messrs. Hickey and Sons, and the sire and progeny group by Messrs. David Young and Sons.

THE GUERNSEYS.

The Guernseys were poorly represented, and the judge, Mr. G. Elliott, of Lismore (New South Wales), got through his task in quick time. Mr. Elliott's opinion was that the standard of the Guernseys was not up to that of two or three years ago. The cattle on the whole presented rather a rough appearance, and showing points were somewhat neglected. The champion bull, however, would compare favourably with any of his class in New South Wales. This was Mr. W. Cooke's Linwood Favour, a descendant of Shamrock X. of Wollongbar, and the reserve championship was awarded to Mr. A. J. Cranney's Linwood Royal's Laddie. The prize for a bull calf, 6 months old and under 12 months, was won by Mr. W. Cooke's Laureldale Viceroy, and the second position was annexed by Mr. H. T. Blanch's Linwood Lone Star.

Cows and Heifers.

The females in the aged class were poorly represented, and for a cow, 4 years old or over, in milk, the first prize was awarded to Mr. H. T. Blanch's Minnamurra Dairymaid, with Pearl XII. of Boorie second. The champion Guernsey cow was Mr. H. T. Blanch's Minnamurra Dairymaid, and the same exhibitor annexed the reserve championship with his Moongi Pearl's Pet. The younger cattle were in rather poor condition, and excited little comment.

Plate 78.—Keenly Interested in the Ring Events.
The Minister for Agriculture and Stock, Hon. Harry F. Walker, and the State Treasurer, Hon. W. H. Barnes.

PLATE 79.—COY OR CAMERA SHY, A HEREFORD QUEEN.

Mr. P. Reynolds' Hobartville Lady Minerva, First and Champion in the 2 years old and under 3 years, Cow or Heifer Class, paraded by her owner for the admiration of the Governor and Lady Goodwin.

THE MEAT INDUSTRY.

AN EXCELLENT EXHIBIT.

Mr. Ernest Baynes, the President of the Royal National Association, is well qualified to discuss the problems of the meat industry, and he was listened to with attention by the large gathering present at the opening of the Meat Industry Hall at the Brisbane Exhibition. Observing that the exhibit was the fourth of the Show, he said that its object was threefold—to demonstrate how the various parts of the animal could be utilised; to encourage better methods of production; and to establish a better understanding of the economic importance of live stock and of the industries associated with it. He explained that 98 per cent. of the occupied territory of the Commonwealth was grass land, the product of which must find an outlet through live stock, and that of the remaining 2 per cent. devoted to agriculture approximately 90 per cent. was used for the production of grain and fodder, which must either find an outlet through live stock or be dependent on live stock for the economical production of grain. Despite that situation, however, they found that Australia was supplying about 8 per cent. of beef, 11 per cent. of lamb, and practically nothing of Great Britain's pig product requirements. The conclusion to be drawn was that the best solution to the Commonwealth's heavy indebtedness was more live stock—particularly meat-producing animals. The exhibit was valuable, because it analysed the situation thoroughly and offered pointers to prosperity in all branches of primary production. He emphasised the final message quoted in the hall—"There is a great need for every section of the country to increase its supply and improve the quality."

The Premier's Speech.

The Premier (Mr. A. E. Moore), officially opening the hall, said that all the leading features connected with the live stock husbandry had been collected, and artistically and graphically described. The information displayed on every exhibit brought home to the people what the live stock industry and its by-products meant to Australia. Mr. Baynes had told them that 8 per cent. of Australia was grass land—not by any means all of it was good grass land—but all of it could be used by scientific fertilisation, and all of it was possible of enormous expansion. It was gratifying to know that efforts were being made by the Bureau of Science and Industry, in conjunction with the Queensland Government, to extend the knowledge of what artificial fertilisers would do to pastures, and what licks and stock foods meant to the cattle industry and to meat production.

The Export Trade.

The Premier stated that in 1909 Australia supplied 26 per cent. of the lamb exported to England, and in 1929 only 8 per cent. In that time England had doubled its importations from 5,000,000 to 10,000,000 carcases, which showed that there was a big opportunity for lamb breeding in Queensland, especially in the Darling Downs. There was also a big field for veal. The State abattoirs would give opportunities in Queensland for providing and selling meat of the highest quality. Queensland should develop the live stock industry with greater intensity—not only in the interests of the people who grow the stock, but in the interests of Australia. We had a large Empire market and other avenues for our products, and we should develop them.

Doubling the Capacity.

Mr. Moore said that he had been much impressed by a remark by Sir George Julius (Chairman of the Bureau of Science and Industry), that if the people of Australia would only make use of the knowledge they had already gained by science in agriculture and go in for top-dressing and stock feeding rather than looking around for more land they could double the capacity of Australia in two years. He (Mr. Moore) was satisfied from what he had seen that that could be done. The meat industry exhibit was another proof of it. The exhibit was of educational value, not only to the general public but to the producers, because it showed them what they ought to aim at—waste products being converted into valuable exportable surplus. The Royal National Association was to be congratulated in making that wonderful exhibit available; it would have a beneficial effect on the future prosperity of Australia.

An Excellent Exhibit.

Mr. J. B. Cramsie (Meat Industry Board, New South Wales) said the exhibit could not be excelled anywhere. Throughout the hall were lessons written in texts that everybody should read. They learned that the Argentine in 1909 exported 600,000 lambs, and in 1928 3,600,000, whereas Australia in 1909 exported 1,300,000 and in

PLATE 80.
The Premier (Mr. Moore) was keenly interested in the Ring Events.

1928 1,150,000. Australia had gone back, whereas Argentine had come on six times. Last year Canada sent huge quantities of bacon to the markets of Great Britain, and took her share of the £56,000,000 that was paid for pig products by the mother country. Australia exported a miserable £5,000 worth of pig products. There was no reason why Australia should not export a very much larger quantity than that. He hoped that Australia would organise the live stock and meat industry until it got a fair share of the British market. We built that market, and were entitled to a fair share of it.

Mr. Eric Sparkes (President of the Queensland Meat Traders' Association) moved a vote of thanks and appreciation to the Royal National Association, which was supported by Mr. W. C. Watkins and Mr. A. B. Anderson. Mr. J. Hiron (chairman of the council) responded.

BEEF CATTLE AT THE SHOW.

Queensland being the most important cattle-producing State in the Commonwealth, it is not surprising that one of the chief features at the show each year is the fine display of stud cattle, particularly of the beef varieties. On this occasion the exhibits in the beef section were of a particularly interesting character, there being entries from leading breeders in the Southern States. In some cases—particularly in the Hereford classes—the chief prizes were annexed by cattle which had won awards at the Sydney Royal, but no one will grudge the victory to the visitors, who had the enterprise to bring their stock many hundreds of miles to Brisbane. The cattle from the other States in all instances met with keen competition on the part of Queensland-bred cattle, and they won on their merits. In those classes in which breeders from the Southern States were victorious, local breeders were afforded a demonstration which will stimulate them to further improve their herds. Without exception, the judges expressed high commendation of the manner in which the locally-bred cattle had been prepared for the show. No pains had been spared to make them attractive to the judge's eye. The keenness of the competition called for extra care on the part of the judges. The larger number of entries in this class—a record in the history of the show—entailed considerably more work on the part of the officials, but every exhibit was accorded careful scrutiny. The judge commented that only in very exceptional cases was a beast shown which did not merit consideration of its claims to an award.

The general verdict of all the judges was that the stud beef exhibits this year were much superior to what had been seen on any previous occasion, showing that local breeders are adopting every means of improving their herds. It was observed that in regard to the principal breeds—Shorthorns, Herefords, and Aberdeen-Angus—the judges prefaced their comments by the remark: "There is a marked improvement in quality this year." The judging proved that this was the case. In some instances cattle which had won last year failed to score. In many instances younger cattle took the places on the prize list, which had been held for several years by doyens of the show ring. The quality shown in the young stock was such that we may confidently anticipate that next year competition will be still keener and the standard still higher.

His Excellency the Governor (Sir John Goodwin) and also Lady Goodwin showed a lively interest in the judging of the beef breeds, and particularly of the Herefords. His Excellency has a thorough knowledge of the points which the judges take into consideration, and he expressed his admiration of the quality of the cattle presented.

SHORTHORNS.

The popularity of the Shorthorn breed in Queensland was amply demonstrated by the large number of entries in this section, and the closeness of the competition in nearly every class. The judge was Mr. Lomax, whose reputation as a breeder, as well as a judge, stands so high that in every instance his decision was cheerfully accepted. At the close of the day's judging, Mr. Lomax said that there were some cattle of outstanding quality in this section, and the fact that they were bred in Queensland was highly creditable to this State.

Last year the Gindie State Farm exhibits won the championship for Shorthorn bull, with Milton Tribesman III., but he was not shown this year. The championship fell to Mr. J. T. Scrymgeour's roan bull, Netherby Royal Challenge, which is under two years of age. This is a deep-fleshed level youngster, showing good masculinity, and well let down. The judge expressed the opinion that if he had had a little more condition he would have shown to even greater advantage in the show ring.

PLATE 81.—HEREFORDS IN THE JUDGING RING.

Sir John and Lady Goodwin, with Mr. Ernest Baynes, were keenly interested in the Stock Parade.

He hesitated for quite a while between this young bull and Milton's Grandmaster, a dark-red three-year old bull belonging to the same owner. His reason for deciding in favour of Netherby Royal Challenge was that he had a little more depth and thickness, notwithstanding the fact that he was giving away a considerable amount in age. The reserve championship thus fell to Milton's Grandmaster.

The championship for the Shorthorn cow provided a very close struggle between a three-year-old heifer, Mr. J. McDougall's Lyndhurst Lily of Gurley II., and a white cow, Mr. J. T. Scrymgeour's Milton's Lovely VI. Ultimately the decision was given in favour of the heifer, which showed much quality and great promise. The judge remarked upon her evenness, and said he expected she would develop into a remarkably fine shower. Milton's Lovely was awarded the reserve championship. This cow was bred by Mr. Anthony Hordern, of New South Wales, many of whose stock have won prizes at the Brisbane shows.

As usual most of the prizes in this section fell to Mr. J. T. Scrymgeour, who owns the fine stud at Netherby, near Warwick.

''Taken all round,'' remarked the judge, ''the cattle showed considerable improvement on past years, and reflect great credit upon the local breeders. Mr. Scrymgeour deserves to be especially complimented upon the condition in which he presented his cattle.''

HEREFORDS.

''There has never been a finer exhibition of Herefords in Brisbane,'' declared Mr. J. A. Beattie, the Nerrandera (N.S.W.) breeder, who officiated as judge. The competition throughout was very keen, and in several instances the judge had great difficulty in making a decision. In the case of the contest for the bull championship, he had to decide between the merits of Mr. P. Reynolds's Hobartville Hercules, a young bull, and the aged bull, Eaton Victor 51st, bred and exhibited by Wilson and McDouall Ltd. Hobartville Hercules had already been awarded the junior championship, and the judge questioned whether that should not preclude him from winning the senior award. The steward, however, pointed out that the conditions of the competition did not provide for that. Indeed, it was shown that five years ago Royal Renown had been awarded both the senior and junior championships. So once more youth won the honours. The champion bull was under two years of age, brimful of quality, and was shown in perfect condition. The judge specially remarked upon its compactness of body, its general high quality, and particularly its thickness and depth of flesh. The reserve champion bull, Eaton Victor 51st, was bred by Wilson and McDouall Ltd., at Calliope Station, Queensland. This bull won the junior championship and reserve championship at the Brisbane Show three years ago.

The championship on the female side also fell to Mr. P. Reynolds, through the agency of Hobartville Lady Minerva 17th, who won the reserve championship at the recent Royal Sydney Show. The runner-up in this instance was Mr. E. R. Reynolds's Ennisview Lady Miss, bred at Oakey (Queensland). The contest was very close.

Mr. Raymond Reynolds, who manages the Hobartville Stud at Richmond (N.S.W.) for his father, Mr. E. P. Reynolds, has shown in Brisbane on previous occasions, but was absent last year, being engaged in officiating as judge elsewhere. He is regarded as one of the best judges of Herefords in the Commonwealth. Queensland appreciates his enterprise in bringing stud stock such a long distance to compete in the show, and his remarkable successes were not begrudged by the competitors. In 1928 he brought four head of Herefords to Brisbane, and secured the senior and junior championships and a reserve championship, as well as five first prizes. On the present occasion, with five head of stock, he captured the championship for bulls and also for cows, and the junior championship for bulls, as well as seven first prizes.

ABERDEEN-ANGUS.

Mr. T. Crawford, the judge of the Aberdeen-Angus section, said that this breed was becoming more popular every year, as was indicated by the increased entries at the Brisbane Show. The exhibits this year were of remarkably high quality, being equal to any seen at provincial shows in the old country. The Aberdeen-Angus breed was particularly suitable for the export trade, and he was, therefore, pleased that the exhibits on this occasion were three times as numerous as last year. The cattle shown fully demonstrated the characteristics of the breed—solid flesh and small bone, which represented economy on the consumer's table. They were a fast-maturing breed, and, unlike some other breeds, did not run to too much fat. Queensland would be moving along sound lines if this breed were introduced more largely on the big stations.

THE AWARDS.

DISTRICT COMPETITIONS—"A" GRADE.

WITH a magnificent and comprehensive display of primary products and manufactures, far excelling those of previous years, the North Coast and Tablelands of New South Wales won the coveted Chelmsford Shield in the contest for "A" grade district exhibits, and retrieved the laurels lost last year. The winning exhibit had a margin of 58½ points over Wide Bay, with the South Coast of Queensland third, 4½ points away.

There is always concern in this contest, and this year there was more discussion and conjecture than ever, which is proof to the National Association that the arranging of such events meets with popularity, not only from the fact of advertising the districts that have arranged the exhibits, but in showing the advancement that is being made in both primary production and manufactures. The maximum points allowed was 1,565, out of which the North Coast and Tablelands District were awarded 1,186, thus securing first place, being 58½ points ahead of Wide Bay and Burnett, with the total of 1,127½ points. The South Coast of Queensland obtained 1,123, which is only 4½ points behind Wide Bay. The Tablelands District of New South Wales thus secured the Chelmsford Shield for a further term. Details:—

—	Maximum Points.	North Coast and Tablelands of N.S.W.	South Coast of Queensland.	Wide Bay and Burnett District
DAIRY PRODUCE—				
Butter (1 box, 56 lb.)	90	84½	84	83
Milk and by-products	40	6	4	2
Cheese	60	35	40	30
Eggs	20	16	14	13
Totals	210	141½	142	128
FOODS—				
Hams and bacon	50	46	48	40
Rolled and smoked beef and mutton	20	18	18	20
Small goods and sausages—smoked or preserved	10	9	8	8
Fish, smoked, preserved, or canned	10	7½	8½	7½
Canned meats	25	21	20	20
Lard, tallow, and animal oils	20	18	18	19
All butchers' by-products	10	7	8	6
Honey and by-products thereof	20	17	18	18
Confectionery, factory made	10	8	9	7
Bread, scones, cakes, and biscuits	10	8	9	8
Totals	185	159½	164½	153½
FRUITS, VEGETABLES, AND ROOTS—FRESH AND PRESERVED—				
Fresh fruits	60	48	52	56
Preserved fruits, jams, and jellies	30	28	30	25
Crystallised and dried fruits	20	18	17	17
Preserved and dried vegetables, pickles, sauces	10	9	8	8
Fresh vegetables	20	15	16	18
Table pumpkins, squashes, and marrows	6	5	4	4
Potatoes, English and sweet	40	20	32	22
Roots (including meals)	14	9	12	10
Coconuts, peanuts, and other nuts	10	9	6	7
Totals	210	161	177	167

DISTRICT COMPETITIONS ("A" Grade)—*continued.*

—	Maximum Points.	North Coast and Tablelands of N.S.W.	South Coast of Queensland.	Wide Bay and Burnett District
Cereals and By-products—				
Wheat	50	45	20	30
Flour, bran, pollard, macaroni, and other meals derived from wheat ..	10	7	5	9
Maize	50	43	30	33
Maizena, meals, starch, glucose, and corn-flour	10	4	4	5
Oats, rye, rice, barley, malt, pearl barley, and their meals	30	24	20	23
Totals	150	123	79	100
Manufactures and Trades—				
All woodwork	30	25	30	25
All metal and ironwork	30	20	25	30
Manufactured woollen and cotton fibre ..	30	24	20	10
Leather and all leather work and tanning ..	20	15	10	10
All sheet-metal work	10	5	10	7
Artificial manures	10	4	8	6
Brooms and brushes	10	7	9	2
Manufactures, not otherwise enumerated ..	15	10	13	11
Totals	155	110	125	101
Minerals and Building Materials—				
Gold, silver, copper, and precious stones ..	25	20	4	20
Coal, iron, other minerals, and salt ..	30	20	9	20
Stone, bricks, cement, marble, terra-cotta	20	10	15	15
Woods, dressed, undressed, and polished ..	25	20	20	25
Totals	100	70	48	80
Tropical Products—				
Sugar cane	60	53	57	55
Sugar, raw and refined	20	15	10	19
Rum, other spirits, and by-products ..	10	..	8	10
Tobacco (cigar and pipe), in leaf	20	16	10	10
Coffee, raw and manufactured, tea, spices, and essences	10	6	6	6
Cotton (raw) and by-products	30	18	20	22
Rubber	10	4	4	..
Oils (vegetable)	10	5	5	5
Totals	170	117	120	127
Wines, &c.—				
Wines	15	12	5	9
Aerated and mineral spa water, vinegar, and and cordials	10	7½	6	7
Ales and stout	10	..	..	7
Totals	35	19½	11	23

DISTRICT COMPETITIONS ("A" GRADE)—*continued.*

—	Maximum Points.	North Coast and Tablelands of N.S.W.	South Coast of Queensland.	Wide Bay and Burnett District
HAY, CHAFF, FODDER, &c.—				
Hay (in bale)—Oaten, wheaten, lucerne, and other varieties	30	28	22	18
Hay in sheaf	5	3	4½	3½
Grasses and their seeds	10	9	8½	6
Chaff—Oaten, wheaten, lucerne, and other varieties	50	44	42	36
Ensilage and other prepared cattle fodder	20	13	13	16
Sorghums and millets, in stalk	10	8	8	9
Commercial fibres	15	11	12	11
Pumpkins, green fodder, and fodder roots	12	7	10	7
Broom millet	10	6½	5½	7½
Farm seeds, including canary seed	13	10	9	9
Totals	175	139½	134½	123
WOOL, &c.—				
Scoured wool	10	10	8	8
Greasy wool	70	70	40	50
Mohair	10	8	5	7
Totals	90	88	53	65
ENLARGED PHOTOGRAPHS—				
Of District Scenery and locally bred live stock	5	5	3	3
EFFECTIVE ARRANGEMENT—				
Comprehensiveness of view	20	13	16	16
Arrangement of sectional stands	25	17	21	20
Effective ticketing	10	7	9	4
General finish	25	15	20	17
Totals	80	52	66	57

SUMMARY OF POINTS.

Dairy produce	210	141½	142	128
Foods	185	159½	164½	153½
Fruits, culinary, vegetables, and roots	210	161	177	167
Cereals and by-products	150	123	79	100
Manufactures and trades	155	110	125	101
Minerals and building materials	100	70	48	80
Tropical products	170	117	120	127
Wines, &c.	35	19½	11	23
Hay, chaff, fodder, &c.	175	139½	134½	123
Wool, &c.	90	88	53	65
Enlarged photographs	5	5	3	3
Effective arrangement	80	52	66	57
Totals	1,565	1,186	1,123	1,127½

	Points.
North Coast and Tablelands, New South Wales (First)	1,186
Wide Bay and Burnett (Second)	1,127½
South Coast of Queensland (Third)	1,123

DISTRICT COMPETITIONS—"B" GRADE.

Brisbane Valley, for the fifth consecutive year, prevailed in the competition for "B" grade district exhibits, which are confined to primary production. Mount Larcom was second, and the Northern Darling Downs third. The winning exhibit was an excellent display, and reflected great credit on the organisers.

The excellent presentations made by the districts entered for the "B" grade competitions in the district displays met with no less appreciation than what was manifested in those of the "A" grade. Competitions were confined to localities wherein only primary production is in evidence. The efforts of the Brisbane Valley management and their supporters were successful in securing the first prize, conjoined with which is the valuable trophy presented by the chairman of the National Association Council, with the total of 989½ points out of the maximum of 1,285, which is a most creditable win.

Mount Larcom committee and workers are to be congratulated on securing second place, with the total of 920½ points. More especially is such the case when the long distances covered in conveying the exhibits is taken into consideration. Northern Darling Downs was third with 902 points. Details of the awards are:—

——	Maximum points.	Mount Larcom.	Oakey.	Kingaroy.	Brisbane Valley.	Northern Darling Downs.	Nanango.
Dairy Produce—							
Butter (1 box, 56 lb.) ..	90	81	83½	83½	82	83	83
Cheese	60	23	50	50	20	56	45
Eggs	20	15	13	14	15	15	14
Totals	170	119	146½	147½	117	154	142
Foods—							
Hams, bacon, rolled and smoked beef and mutton	50	43	47	44	41	42	42
Fish—Smoked	10	8	5	3	3½	3	5½
Lard, tallow, and animal oils..	20	17	17	18	19	18	15
Honey and by-products thereof	20	14	12	15	17	11	9
Confectionery (home made) ..	10	6	8	8	8	8	7
Bread, scones, cakes, and biscuits (home made) ..	10	8	8	9	7	6	8
Totals	120	96	97	97	95½	88	86½
Fruits, Culinary, Vegetables, Roots, &c. (Fresh and Preserved)—							
Fresh Fruits	60	48	25	40	50	42	20
Preserved fruits, jams, and jellies (home made) ..	30	24	22	22	25	24	22
Crystallised and dried fruits (home made or dried) ..	20	18	18	16	18	14	14
Preserved and dried vegetables, pickles, sauces (home made or dried)	10	8	6	7	8	7	8
Fresh vegetables, all kinds, excluding potatoes)	20	16	17	14	18	15	14
Table pumpkins, squashes, and marrows	6	5	5	5	5	5	6
Potatoes, English and sweet ..	40	23	21	30	35	21	32
Roots and their products, including meals, arrowroot, cassava, ginger	14	10	6	7	12	8	5
Coconuts, peanuts, and other nuts	10	6	7	9	8	7	7
Vegetable seeds	10	6	4	8	7	5	6
Totals	220	162	131	158	186	148	134

DISTRICT COMPETITIONS ("B" GRADE)—*continued.*

—	Maximum points.	Mount Larcom.	Oakey.	Kingaroy	Brisbane Valley.	Northern Darling Downs.	Nanango.
CEREALS AND BY-PRODUCTS—							
Wheat	50	29	44	27	33	45	35
Flour, bran, pollard, macaroni, and other meals	10	8	5	5	5	8	5
Maize	50	34	34	36	46	38	40
Maizena, meals, starch, glucose, and cornflour	10	8	5	7	5	5	8
Oats, rye, rice, barley, malt, pearl barley, and their meals	30	21	23	19	25	17	15
Totals	150	100	111	94	114	113	103
WOODS—							
Woods, dressed, undressed, and polished	25	20	18	20	25	20	20
Wattle bark	15	10	12	15	15	10	10
Totals	40	30	30	35	40	30	30
HIDES (1) AND HOME PRESERVES—							
Skins for domestic use ..	15	13	12	11	11	10	10
TROPICAL PRODUCTS—							
Sugar-cane	60	40	4	9	16	6	7
Coffee, tea, and spices ..	10	5	..	7	7	5	6
Cotton (raw) and by-products	30	22	20	20	25	22	18
Tobacco (cigar and pipe), in leaf	20	12	14	16	16	12	14
Totals	120	79	39	52	64	45	45
MINERALS—							
Gold, silver, copper, and precious stones	25	17	6	12	16	9	12
Coal, iron, and other minerals, and salt	30	17	10	16	20	14	12
Totals	55	34	16	28	36	23	24
HAY, CHAFF, FODDER, &c.—							
Hay (in bale)—Oaten, wheaten, lucerne, and other varieties	30	18	23	20	28	23	20
Hay in sheaf	5	3½	4	4	3½	4	3½
Grasses and their seeds ..	10	7	9	9	9½	8½	7
Chaff—Oaten, wheaten, lucerne, and other varieties ..	50	34	38	30	48	28	32
Ensilage and other prepared cattle fodder	20	15	12	13	17	14	13
Sorghums and millets ..	10	8	7½	7½	9	9	7½
Commercial fibres, hemp, and flax	15	13	6	6	14	12	10
Pumpkins, green fodder, and fodder roots	12	8	10	8	10	9	9
Broom millet, ready for manufacture	10	6	6½	8	9	9	9
Farm seeds, including canary seed	13	9	10	8	11	8	10
Totals ..	175	121½	126	113½	159	124½	121

DISTRICT COMPETITIONS ("B" Grade)—*continued.*

—	Maximum points.	Mount Larcom.	Oakey.	Kingaroy.	Brisbane Valley.	Northern Darling Downs.	Nanango.
Wool, &c.—							
Scoured wool	10	8	9	5	8	10	5
Greasy wool	70	63	70	55	45	65	55
Mohair	10	6	9	6	7	8	5
Totals	90	77	88	66	60	83	65
Enlarged Photographs—							
Of District scenery and locally bred live stock	5	3	4	4	4	4	2
Ladies' and Schools Work and Fine Arts—							
Needlework and knitting ..	25	18	12	18	25	16	14
School needlework	5	1	1	2½	5	1½	2
Fine arts	5	3	3	5	3	4	4
School work—Maps, writing, &c.	10	6	8	7	8	5	9
Totals	54	23	24	32½	41	26½	29
Effective Arrangement—							
Comprehensiveness of view ..	20	16	16	14	16	15	14
Arrangement of sectional stands	25	16	20	16	18	15	16
Effective ticketing	10	7	7	5	7	5	5
General finish	25	19	21	15	21	18	15
Totals	80	58	64	50	62	53	50

SUMMARY OF POINTS.

Dairy produce	170	119	146½	147½	117	154	142
Foods	120	96	97	97	95½	88	86½
Fruits, culinary, vegetables, roots, &c.	220	162	131	158	186	148	134
Cereals and by-products	150	100	111	94	114	113	103
Woods	40	30	30	35	40	30	30
Hides and home preserved skins ..	15	13	12	11	11	10	10
Tropical products	120	79	38	52	64	45	45
Minerals	55	34	16	28	36	23	24
Hay, chaff, fodder, &c.	175	121½	126	113½	159	124½	121
Wool, &c.	90	77	88	66	60	83	65
Enlarged photographs	5	3	4	4	4	4	2
Ladies' and schools work and fine arts	45	28	24	32½	41	26½	29
Effective arrangement	80	58	64	50	62	53	50
Totals	1,285	920½	887½	888½	989½	902	841½

First and Chairman's Trophy, Brisbane Valley; Second, Mount Larcom; Third, North Darling Downs.

ONE FARM.

FOUR EXCELLENT ENTRIES.

There was convincing proof that life in the country can be made pleasant where there is harmony in family associations; and that homes in the country have pleasures and enjoyments in many ways not known in the towns and cities. The maximum number of points was fixed at 656, out of which Mr. Ponton, who won last year, secured 510½. Mr. J. T. Whiteway, of Buderim, was second, with 505½, being only five points behind Mr. Ponton. Mr. E. J. Rossow, of Nanango, was third, with 482, and Mr. J. Beck, from the Stanwell district, of Central Queensland, fourth, with 480. There is thus shown how close was the competition. Details of the awards are:—

—	Maximum Points.	J. T. Whiteway, Buderim.	E. J. Rossow, Nanango.	J. Beck, Stanwell.	W. D. Ponton, Tuggerah, N.S.W.
PRODUCE—					
Butter	25	22½	19	22	21½
Eggs	5	3	2	2½	5
Totals	30	25½	21	24½	26½
FOODS—					
Hams and bacon (15 lb.)	20	15	17	17	19
Honey and by-products	15	15	8	7	12
Beeswax	5	3	2	2	4
Bread, scones	5	4	5	4	5
Confectionery	5	5	4	4	4
Home cookery	7	6	6	5	5
Lard, tallow, and animal oils	5	4	4	5	5
Totals	72	58	54	54	62
FRUITS, VEGETABLES, AND ROOTS—					
Fresh fruits	25	20	10	15	12
Preserved fruits, jams, and jellies	15	13	10	12	13
Crystallised and dried fruits	10	9	6	7	9
Preserved and dried vegetables, pickles, and sauces	15	11	8	8	12
Fresh vegetables	15	13	12	11	11
Table pumpkins	10	8	9	8	9
Potatoes, English and sweet	20	13	19	10	13
Nuts	7	6	1	3	2½
Vegetable seeds	5	4	5	0½	5
Roots, all kinds	15	14	9	11	11
Home-made meals	3	3	2	2½	1½
Totals	140	114	91	88	99
CEREALS AND BY-PRODUCTS—					
Wheat	25	6	11	9	24
Maize	25	24	25	18	24
Barley, oats, rye, and rice	20	8	13	16	20
Home-made meals	10	9	10	8	10
Totals	80	47	59	51	78
TROPICAL PRODUCTS—					
Sugar-cane	30	18	10	17	4
Cotton in seed	20	10	12	18	14
Coffee	6	4	4	5	5
Tobacco leaf	10	7	7	7	8
Totals	66	39	33	47	31

ONE FARM—*continued.*

——	Maximum Points.	J. T. Whiteway, Buderim.	E. J. Rossow, Nanango.	J. Beck, Stanwell.	W. D. Ponton, Tuggerah, N.S.W.
Hay, Chaff, Fodder, &c.—					
Hay	20	16	18	20	20
Hay in sheaf	5	4	5	3½	5
Grasses and seeds	10	10	8	9	10
Chaff	20	17	19	20	17
Ensilage	15	13	15	14	9
Cattle fodder	15	14	15	13	11
Sorghum and millet	10	8	9	10	9
Broom millet	10	8	9	10	9
Farm seeds	7	6	6	5	7
Commercial fibres	10	10	8	7	10
Totals	122	106	112	111½	107
Wool—					
Greasy	20	18	20	15	18
Mohair	5	3	5	5	4
Totals	25	21	25	20	22
Drinks, &c.	15	12	10	10½	9
Women's and Children's Work—					
Needlework	10	9½	9	6	5
Fine arts	5	2	2	1	3
Fancy work	15	10	9	8	6
School work	5	5	4	4	3
School needlework	5	2	2½	3	2
Totals	40	28½	26½	22	19
Miscellaneous	10	9	7	7	10
Plants and seeds	6	6	5	5	5
Useful articles	10	9	7½	10	10
Effective Arrangement—					
Comprehensiveness	10	8	9	9	8
Arrangement	10	7	8	7	9
Ticketing	5	4½	3	3½	4
Finish	15	11	11	10	11
Totals	40	30½	31	29½	32

SUMMARY.

Produce	30	25½	21	24½	26½
Foods	72	58	54	54	62
Fruits and vegetables	140	114	91	88	99
Cereals and by-products	80	47	59	51	78
Tropical products	66	39	33	47	31
Fodder	122	106	112	111½	107
Wool	25	21	25	20	22
Drinks	15	12	10	10½	9
Women's and children's work	40	28½	26½	22	19
Miscellaneous	10	9	7	7	10
Plants and seeds	6	6	5	5	5
Useful articles	10	9	7½	10	10
Arrangement	40	30½	31	29½	32
Grand Totals	656	505½	482	480	510½

DISTRICT FRUIT CONTESTS.

Queensland's vast orchard wealth was illustrated remarkably by the imposing displays in the fruit pavilion. The bananas, in the opinion of the judge (Mr. A. G. Gordon), constituted the best exhibit for the past five years. The citrus exhibits were a profusion of excellence. A feature was an apple trophy from The Summit, the fruit being arranged in an imposing pyramid. It was awarded first prize. The pineapples were a delight to behold. Mr. J. P. Pringle (Woombye) gained first prize in smooth leaf pineapple and canning varieties. He practically swept the board in this branch, gaining the trophy for five pines in cases packed for export. The whole display in the pavilion was most effectively arranged by Mr. T. H. Brown, of Montville, and his assistants. Custard apples, strawberries, jack fruit, mandarins, oranges, papaw, grape fruit, and lemons were in a profusion of excellence, and drew from admiring crowds well deserved admiration. The judges, Messrs. A. G. Gordon, Wamuran, H. Wilmott, Victoria Point, and N. C. Richards, Howard, were unanimous in their praise of the general quality of all fruit sent in, both for the competitors and non-competitors' sections. Gayndah won the annual shield for the best display of pines, bananas, and citrus. For bananas the Cooran and Kin Kin Fruitgrowers' Association again won the shield. This association has now won the shield every year since its inception six years ago. A very noteworthy exhibit was a bunch of cavendish bananas shown by Mr. H. Cooper, Sarina. Details:—

—	Possible Points.	Buderim.	Cooran and Kin Kin.	Gayndah.	Montville.	Palmwoods.	Woombye.
Bananas	35	27	33	..	27	31	29
Pineapples	35	27⅔	20⅔	..	24½	30⅔	30½
Citrus fruits	35	27	14	33	32	32	28
Custard apples	10	6	5	..	9	7	7
Papaws	10	8	8	..	8	9	8
Strawberries	10	7	6	..	5	10	7
All other fruits	10	7	7	..	8	9	7
Grading and packing in export classes	35	26⅓	20⅓	11⅔	26⅔	30⅓	28⅓
General display	20	17	14½	18½	18	18½	16½
Totals	200	153	128½	63⅙	158⅙	177½	161⅓

BANANA SHIELD.

—	Quality.	Grading.	Packing.	Total.
COORAN AND KIN KIN—				
Cavendish	28	22	23	73
Lady Fingers	6	..	..	6
Sugars	2	..	..	2
Other varieties	4	..	..	4
				85
PALMWOODS—				
Cavendish	26	22	22	70
Lady Fingers	7	..	..	7
Sugars	2	..	..	2
Other varieties	2	..	..	2
				81

DISTRICT FRUIT CONTESTS—*continued.*

BANANA SHIELD—*continued.*

—	Quality.	Grading.	Packing.	Total.
WOOMBYE—				
Cavendish	24	22	21	67
Lady Fingers	8	..	..	8
Sugars	3	..	..	3
Other varieties	2½	..	..	2½
				80½
BUDERIM—				
Cavendish	22	21	20	63
Lady Fingers	9	..	..	9
Other varieties	2	..	..	2
				74
MONTVILLE—				
Cavendish	22	21	18	61
Lady Fingers	5	..	..	5
Sugars	1½	..	..	1½
Other varieties	3	..	..	3
				70½

CITRUS SHIELD.

GAYNDAH—				
Oranges	19	10	10	39
Mandarins	18	10	10	38
Lemons	10	2	3	15
Other varieties	3	..	..	3
				95
MONTVILLE—				
Oranges	19	9	10	38
Mandarins	18	10	10	38
Lemons	7	2	3	12
Other varieties	3½	..	..	3½
				91½
PALMWOODS—				
Oranges	19	10	9	38
Mandarins	18	10	10	38
Lemons	7	2	3	12
Other varieties	3	..	..	3
				91
WOOMBYE—				
Oranges	17	9	8	34
Mandarins	17	8	8	33
Lemons	5	2	3	10
Other varieties	3	..	..	3
				80

DISTRICT FRUIT CONTESTS—*continued.*

CITRUS SHIELD—*continued.*

—	Quality.	Grading.	Packing.	Total.
BUDERIM—				
Oranges	16	8	7	31
Mandarins	16	8	8	32
Lemons	8	2	2	12
Other varieties	3	..	..	3
				78
COORAN AND KIN KIN—				
Oranges	8	4	4	16
Mandarins	9	4	4	17
Lemons	3	1	1	5
Other varieties	2	..	..	2
				40

PLATE 82.—KEEN JUDGES OF HORSEFLESH.

Professor E J. Goddard (Dean of the Faculty of Agriculture, Queensland University) and Major-General Spencer Browne were interested in the Hacks and Hunters.

MILKING TESTS.

ANOTHER AUSTRALASIAN ENTRY RECORD.

The results of this year's milking contests reveal remarkable figures, and illustrate to all who have any knowledge of the dairying industry the high standard of quality attained by Queensland dairy breeders. The stewards of the section, Messrs. A. M. Hunt and J. Stimpson, both well-known breeders, spoke in high terms of what were truly great performances.

Those who undertake the supervision of the milking contests have no easy task, for not only has each milking to be closely watched, but the official who does the testing has a long and tedious time. There is also the necessity for some one other than the owner to be present at the milking of each cow or heifer, in which respect voluntary work was performed by many interested in the tests. For this assistance the supervising stewards expressed their appreciation. The first prize was won by Mr. B. O'Connor, with his Australian Illawarra Shorthorn, Rosette of Wilga Vale, which, with the yield of 5.8192 lb. butter fat, received 46.55 points. The reserve honour was secured by Mr. A. T. Waters for his Australian Illawarra Shorthorn, Fussy V. of Railway View, with 5.1486 lb. of butter fat, for which 46.09 points were allotted. Last year, Mr. A. Caswell won the prize with his Illawarra Milking Shorthorn, Rosie 4th of Greyleigh, with 4.9271 lb. of butter fat. The yield of Mr. O'Connor's Rosette of Wilga Vale is, therefore, ahead of what was recorded last year.

Mr. L. Anderson, Senior Herd Tester for the Department of Agriculture, in speaking on the gound milking tests, remarked that there had been a record for Australasia in the number of cattle that had been entered. The returns showed that the standard was well up to previous years. The competition was carried out at each show for a period of forty-eight hours, commencing on the Saturday afternoon previous to the opening. In the younger classes high production was particularly noticeable, and in the heifers under 3 years old there were some wonderful returns. The competitions were for all breeds, the Australian Illawarra Shorthorns being strongly represented, and there were a fair number of Jerseys, Friesians, and Ayrshires.

The winner of the principal event, Rosette of Wilga Vale, which carries with it the title of champion, is a typical Australian Illawarra Shorthorn. Another animal to give an excellent yield was that confined to the Jersey breed, which was won by Mr. E. Burton's cow, between the ages of three and four years, Oxford Daffodil.

Cow, four years or over, averaging the greatest daily yield of butter fat for 48 hours Points for lactation period being conceded.

——	Milk.	Fat.	Butter Fat	Points.	Lact. Points.	Total.
	Lb.	Per cent	Lb.			
B. O'Connor's Rosette of Wilga Vale (A.I.S.)—						
Night	21·7	4·4	·9548	..	..	..
Morning	27·1	3·8	1·0298	..	..	..
Noon	22·3	5·0	1·1150	..	..	..
Night	22·6	4·0	·9040	..	..	..
Morning	26·1	3·4	·8874	..	..	..
Noon	22·1	4·2	·9282	..	..	..
Total, 48 hours; average, 24 hours	141·9	..	5·8192 2·9096	.. 46·55	.. Nil	.. 46·55
A. T. Waters' Fussy V. of Railway View (A.I.S.)—						
Night	23·2	3·5	·8120	..	..	..
Morning	17·2	4·1	·7052	..	..	..
Noon	14·8	4·4	·6512	..	..	..
Night	15·8	4·3	·6794	..	..	..
Morning	17·7	4·2	·7434	..	..	..
Noon	15·3	4·5	·6885	..	..	..
Total, 48 hours; average, 24 hours	133·5	..	5·1486 2·5743	.. 41·19	.. 4·9	.. 46·09

MILKING TESTS—*continued.*

Cow, four years or over, averaging the greatest daily yield of butter fat for 48 hours. Points for lactation period being conceded—*continued.*

——	Milk.	Fat.	Butter Fat.	Points.	Lact. Points.	Total.
	Lb.	Per cent.	Lb.			
J. Phillips's Myrtle IV. of Lemon Grove (A.I.S.)—						
Night	23·9	3·1	·7409	. .	. .	. .
Morning	26·6	3·4	·9044	. .	. .	. .
Noon	23·8	3·7	·8806	. .	. .	. .
Night	23·4	4·1	·9594	. .	. .	. .
Morning	25·8	3·1	·7999	. .	. .	. .
Noon	23·1	3·7	·8547	. .	. .	. .
Total, 48 hours; average, 24 hours	146·6	. .	5·1398 2·5699	. . 41·12	. . 1·1	. . 42·22

Cow, three years old and under four years, averaging the greatest daily yield of butter for 48 hours. Points for lactation period being conceded.

——	Milk.	Fat.	Butter Fat.	Points.	Lact. Points.	Total.
E. Burton and Sons' Oxford Daffodil (Jersey)—						
Night	15·6	6·2	·9672	. .	. .	. .
Morning	16·2	4·8	·7776	. .	. .	. .
Noon	14·1	6·0	·8460	. .	. .	. .
Night	14·5	5·7	·8265	. .	. .	. .
Morning	15·4	4·5	·6930	. .	. .	. .
Noon	13·1	5·2	·6812	. .	. .	. .
Total, 48 hours; average, 24 hours	94·4	. .	4·7915 2·3957	. . 38·33	. . Nil	. . 38·33
D. Spoor and Sons' Emma XI. of Springdale (A.I.S.)—						
Night	16·4	4·0	·6560	. .	. .	. .
Morning	18·5	3·9	·7125	. .	. .	. .
Noon	14·5	4·3	·6235	. .	. .	. .
Night	14·3	3·9	·5577	. .	. .	. .
Morning	17·3	3·9	·6747	. .	. .	. .
Noon	13·4	4·1	·5494	. .	. .	. .
Total, 48 hours; average, 24 hours	94·4	. .	3·7828 1·8914	. . 30·26	. . 5·0	. . 35·36
J. H. Wade's Duchess of Wadedale (A.I.S.)—						
Night	16·1	4·5	·7560	. .	. .	. .
Morning	17·2	4·1	·7502	. .	. .	. .
Noon	14·8	4·4	·6512	. .	. .	. .
Night	15·8	4·3	·6794	. .	. .	. .
Morning	17·7	4·2	·7434	. .	. .	. .
Noon	15·3	4·5	·6885	. .	. .	. .
Total, 48 hours; average, 24 hours	118·0	. .	4·2239 2·1118	. . 33·79	. . Nil	. . 33·79

MILKING TESTS—*continued.*

Heifer, under three years old, averaging the greatest daily yield of butter fat for 48 hours. Points for lactation period being conceded.

—	Milk.	Fat.	Butter Fat	Points.	Lact. Points.	Total.
J. Phillips's Melba of Sunny View (A.I.S.)—						
Night	18·2	2·9	·5278	..	..	..
Morning	20·9	2·5	·5225	..	..	..
Noon	18·4	3·1	·5704	..	..	..
Night	19·9	3·2	·6368	..	..	..
Morning	21·5	3·0	·6450	..	..	..
Noon	19·1	3·4	·6494	..	..	..
Total, 48 hours; average, 24 hours	118·0	..	3·5519 1·7759	.. 28·41	.. Nil	.. 28·41
Hickey and Sons' Glendalough Queen (A.I.S.)—						
Night	13·0	3·5	·4550	..	..	..
Morning	15·7	2·9	·4553	..	..	..
Noon	12·6	3·4	·4284	..	..	..
Night	12·8	3·3	·4224	..	..	..
Morning	16·0	3·0	·4800	..	..	..
Noon	12·0	3·4	·4080	..	..	..
Total, 48 hours; average, 24 hours	82·1	..	2·6491 1·3245	.. 21·19	.. 7·0	.. 28·29
J. Williams' Bonny Star of Lisieux (Jersey)—						
Night	8·5	5·8	·4930	..	..	..
Morning	10·1	4·9	·4949	..	..	..
Noon	8·4	6·4	·5376	..	..	..
Night	8·8	5·7	·5016	..	..	..
Morning	10·1	4·9	·4949	..	..	..
Noon	8·9	5·5	·4895	..	..	..
Total, 48 hours; average, 24 hours	54·8	..	3·0115 1·5057	.. 24·09	.. 3·8	.. 27·89

Cow, four years or over, averaging the greatest daily yield of butter fat for 48 hours.

—	Total Milk.	Total Butter Fat	Average Butter Fat
	Lb.	Lb.	Lb.
B. O'Connor's Rosette of Wilga Vale (A.I.S.)	141·9	5·8192	2·9096
A. T. Waters' Fussy V. of Railway View (A.I.S.) ..	133·5	5·1486	2·5743
J. Phillips's Evelyn of Sunny View (A.I.S.)	149·4	4·9943	2·4971
Cow, three years old and under four, averaging the greatest daily yield of butter fat for 48 hours.			
E. Burton and Sons' Oxford Daffodil (Jersey)	88·9	4·7915	2·3957
S. J. Lester's Susie IV. of Hillfields (A.I.S.)	109·8	4·3480	2·1740
J. H. Wade's Duchess of Wadedale (A.I.S.)	97·6	4·2237	2·1118
Heifer, under three years, averaging the greatest daily yield of butter fat for 48 hours.			
J. Phillips's Melba of Sunny View (A.I.S.)	118·0	3·5519	1·7759
F. O. Hayter's Emma of Spurfield (A.I.S.)	96·6	3·4739	1·7369
A. Pickel's Stella of Blacklands (A.I.S.)	102·3	3·4334	1·7167

MILKING TESTS—*continued.*

Jersey cow or heifer, any age, averaging the greatest daily yield of butter fat for 48 hours.

——	Total Milk.	Total Butter Fat.	Average Butter Fat
E. Burton and Sons' Oxford Daffodil	88·9	4·7915	2·3957
J. Williams' Carlyle Pamela	87·4	4·2493	2·1246
J. Hunter and Sons' Pine View Buttercup	78·5	4·0938	2·0469

Dairy Cow, any age, producing greatest quantity of butter fat in 273 days test—

J. Collin's Duchess of Calton (Jersey), 634 lb. of butter fat.

Cow, yielding the greatest quantity of milk in 48 hours:—

J. Phillips's Evelyn of Sunny View (A.I.S.), 149.4 lb.

B. O'Connor's Rosette of Wilga Vale (A.I.S.), 141.9 lb.

A. T. Waters's Fussy V. of Railway View (A.I.S.), 133.5 lb.

Royal National Champion Butter Fat Test, cow or heifer (pure bred), averaging greatest daily yield of butter fat for 48 hours, lactation points being conceded. First prize, £5 and champion ribbon.

B. O'Connor's Rosette of Wilga Vale (.A.I.S.), 46.55 points (champion).

A. T. Waters's Fussy V. of Railway View (A.I.S.), 46.09 points (reserve champion).

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF JULY, IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALL DURING JULY, 1930 AND 1929, FOR COMPARISON.

Divisions and Stations.	AVERAGE RAINFALL. July.	AVERAGE RAINFALL. No. of Years' Records.	TOTAL RAINFALL. July, 1930.	TOTAL RAINFALL. July, 1929.
North Coast.	In.		In.	In.
Atherton	0·98	29	1·89	0·52
Cairns	1·56	48	2·95	0 46
Cardwell	1·36	58	1·29	0·18
Cooktown	0·98	54	0·99	0·54
Herberton	0·78	43	1·16	0·29
Ingham	1·51	38	1·09	0·50
Innisfail	4·66	49	5·84	1·49
Mossman	1·31	17	0·70	0·03
Townsville	0·63	59	0·31	0·06
Central Coast.				
Ayr	0·70	43	0·18	..
Bowen	0·92	59	0·20	0·06
Charters Towers	0·64	48	0·08	..
Mackay	1·65	59	0·30	0·22
Proserpine	1·31	27	3·10	0·05
St. Lawrence	1·28	59	0·60	0·02
South Coast.				
Biggenden	1·34	31	1·41	0·12
Bundaberg	1·81	47	1·32	0·04
Brisbane	2·23	79	1·25	0·53
Caboolture	2·16	43	1·56	0·32
Childers	1·68	35	1·70	0·04
Crohamhurst	2·87	37	3·33	0·32
Esk	1·96	43	2·43	1·19
Gayndah	1·45	59	0·86	0·05
Gympie	2·14	60	1·54	0·55
Kilkivan	1·62	51	1·40	0·39
Maryborough	1·88	58	0·96	0·03

Divisions and Stations.	AVERAGE RAINFALL. July.	AVERAGE RAINFALL. No. of Years' Records.	TOTAL RAINFALL. July, 1930.	TOTAL RAINFALL. July, 1929.
South Coast—continued:	In.		In.	In.
Nambour	2·70	34	1·60	0·30
Nanango	1·67	48	1.51	0·25
Rockhampton	1·42	43	1·26	..
Woodford	2·36	43	2·00	0·38
Darling Downs.				
Dalby	1·71	60	3·02	0·57
Emu Vale	1·54	34	1·49	0·57
Jimbour	1·55	42	1·60	0·35
Miles	1·64	45	1·12	0·39
Stanthorpe	2·03	57	1·93	1·11
Toowoomba	2·02	58	2·55	0·69
Warwick	1·80	65	2·99	0 76
Maranoa.				
Roma	1·43	56	1·28	0·19
State Farms, &c.				
Bungeworgorai	1·34	16	0.90	0·06
Gatton College	1·32	31	0.96	0·65
Gindie	0·92	31	0·55	..
Hermitage	1·68	24	2·08	0·76
Kairi	1·16	16	1·52	0·45
Mackay Sugar Experiment Station	1·42	33	..	0 16
Warren	1·12	15	..	..

GEORGE G. BOND, Divisional Meteorologist.

DISEASES OF THE PIG.*

E. J. SHELTON, H.D.A., Senior Instructor in Pig Raising.

In the preparation of information dealing with Diseases of the Pig, an endeavour has been made to describe in the simplest language possible the various conditions, abnormal and otherwise, associated with the incidence or appearance of disease in swine. The suggested preventive measures and methods of treatment are such as may be successfully carried out by any careful farmer, excepting only in cases where the services of a qualified veterinarian are advised, and in these cases the best methods to follow will be suggested on the spot by the surgeon himself.

The pig is notoriously a bad patient and a difficult animal to handle when indisposed, hence great stress has been laid throughout this treatise on the necessity of preventive measures, for prevention is not only much better than cure, but is invariably less costly and a great deal more satisfactory.

In dealing with methods of treatment and the engagement of qualified aid, it has been realised there are numerous difficulties in the way, because Departmental officers or practising veterinarians are not always immediately available in town or country districts. Again, therefore, we stress that prevention is better than cure, and we might even qualify this further by adding prevention is more necessary than cure.

Mr. Shelton's bulletin, representing as it does a vast amount of labour and the fruits of careful study and observation, is a welcome contribution to current pig literature.—EDITOR.

A SOUND knowledge of the business of pig raising and a liking for the job are attributes without which success would not be possible. Absolute cleanliness in all operations and the realisation that the business cannot possibly prove profitable unless conducted along correct lines, indicates a line of thought along which we work in discussing prevention and in dealing in detail with the different conditions as they arise. The provision of suitable accommodation for all the animals kept, and a regular and efficient food and water supply are the initial requirements, nor would it be safe to suggest entry into the industry unless these be arranged for. Equally necessary are foundation animals from healthy, well-developed stock of strains noted for prolificacy, rapid growth, and suitability for market requirements. Suitable stock are, in most instances, readily available at comparatively low rates, and, even where these cannot be secured locally, they can be selected from reputable herds in clean districts, and be safely transported at a minimum of cost. The provision of one or two "hospital" pens, into which newly purchased stock may be placed for a few days, and to which stock may be transferred when noted to be "off colour," are advised; such pens are an

* The typescript and illustrations of the Farmers' Bulletin on Diseases of the Pig have been submitted to the Chief Inspector of Stock, Major A. H. Cory, M.R.C.V.S., Department of Agriculture and Stock, Brisbane, Queensland.

Copies of the Bulletin may be had gratis on application to the Under Secretary, Department of Agriculture and Stock, Brisbane, Queensland.

In the compilation of this paper the writings of recognised authorities in other States and other parts of the world have been drawn on, and the assistance thus received, also that freely given by other Departmental officers, is acknowledged gratefully.

immense advantage and a necessity, and their provision should not be looked upon as merely the fad of a theorist, for in the stock world hospital accommodation is just as essential as it is in the world of human beings, especially where a large number of animals are kept and where the area available for grazing is limited. These pens should be kept in readiness at all times and be in an hygienic condition and capable of being kept clean.

The provision of a supply of the commoner drugs, castor oil, Epsom salts, &c., is certainly essential, especially in centres where it is inconvenient to secure these as required, at short notice. The pig is such a bad patient that, when he is sick, he is down and out and cares but little whether he lives or dies, hence immediate attention is necessary once it is noticed he is off tucker and out of sorts. Much patience is necessary in attending to sick pigs and it is urged that the owner or attendant should be as reasonable as possible in handling the patient. It is not always correct to assume that "the back of the farm axe" is the best remedy if the pig shows signs of ill health.

The Incidence of Disease.

The incidence of disease in pigs may be reasonably grouped under the following headings, all of which have a direct bearing upon the general care, breeding, feeding, and management of this class of stock —i.e., ailments and diseases may be due to or exaggerated by—

(1) Dietetic causes (neglected feeding, impure or unsuitable foods).
(2) Hygienic causes (filthy sties, low-lying, damp, and badly drained areas).
(3) Parasitic infestation (lice, worms).
(4) Constitutional weakness (predisposing stock to ill health).
(5) Hereditary predisposition (particularly in abnormalities of the sexual organs).
(6) Local causes (accidents, bruising, malformations).
(7) Diseases due to specific organisms or the products of germ life (fevers, poisoning).
(8) Unknown or unspecified causes.

As to which (one or more) of these causes would be the responsible one in the case of any particular disease would probably be difficult to decide upon, but in almost every instance the occurrence of disease indicates neglect in one form or other for, where healthy, well-developed stock are kept under conditions favourable to development, disease is not likely to take toll, nor is there other than an ordinary business risk in so far as finances are concerned.

INDICATIONS OF ILL HEALTH.

Ante-mortem Inspection.

To the experienced eye, it is not difficult to determine when an animal is sick or when ill health is developing, but to the inexperienced farmer ante-mortem inspection is quite a difficult job. It is equally difficult to determine with any degree of accuracy the possible cause. Taking the temperature of the animal, recording the pulse and making other necessary observations is equally difficult, especially as this part of the business requires detailed attention, but when the powers of

observation have been developed, it is not necessarily difficult, and one soon learns whether an animal requires medicine or other forms of treatment. Usually the first indication of an abnormal condition is that the animal has no desire for food, he is "off tucker," but has an abnormal thirst and is inclined to hide away in the corner of the yard, either under cover of straw, grass, or exposed to the elements. Such an animal appears depressed, dull and tired, the head hangs limp, the back is arched, the tail hangs lifeless, he moves painfully, if at all, and takes little or no notice of other stock or of his attendants. The hair, which is ordinarily glossy, appears rough and staring, standing on end as the animal arches the back and drops the head; the skin is hot, dry, and there may be unusual tightness (hidebound). The bowels are invariably affected early in the attack and constipation or diarrhœa may be noted, the urine is scanty, yellowish, and evil smelling. The bodily temperature varies, in fevers it is high, in some disorders it is variable and below normal (102·6 deg. Fahr.). The pulse is either rapid or very faint, the breathing is short, jerky, painful or rapid, while coughing or difficult breathing may be a feature; the nose is hot and dry, and lacks the characteristic beads of healthy perspiration; there may be whitish discharges from the nostrils and eyes, a frothy discharge from the mouth or unnatural discharges from the bowels, bladder, or sexual organs. Dry greyish scurf or scales may form around the eyes as a result of a discharge therefrom, while in diseases of the eye, there may be a sticky discharge, and the eyelids may even become partially glued together, especially after the evening's rest. An irritating cough and heavy breathing indicates affections of the lungs and bronchial tubes. Paleness and inflammation of the mucous membranes of the eyes, nostrils, mouth, and other external openings indicates an anæmic condition, while a distinctly yellowish appearance of these membranes indicates disorders of the liver (jaundice).

Where injuries are responsible for the ailment it is possible examination may indicate inflammation, abscess formation, discharge of pus, growth of proud flesh, fractures, lacerations, or other abnormal conditions with resultant difficulty of movement (stiffness). In diseases of the mammary glands (udders) there may be inflammation and the parts may feel hot and very hard to the touch, or there may be local irritaton and inflammation as in cow pox, or bleeding or the formation of scales where the teats or udders have been lacerated. Dropsical conditions are indicated by extreme obesity with loss of condition, bowel disorders by extreme difficulty in passing the fæces, or by profuse diarrhœa, &c. There are other conditions too, referred to in dealing with individual diseases like paralysis, rickets, in which the limbs are affected and the animal is unable to move about freely.

Post-mortem Examination.

The indications of disease found on an examination of the carcass or viscera (internal organs) after death vary considerably with the nature of the ailments or disease, hence, to become more conversant with these conditions, the farmer should make every effort to study the subject and gain as much practical experience as possible by visiting bacon factories or slaughtering establishments, and noting the condition of the various carcasses and of the viscera, both healthy and diseased. Diseases like tuberculosis (T.B.) are difficult to locate in pigs on ante-mortem inspection, but are usually readily located by the meat inspector

on post-mortem examination. It is these diseases in which there are practically no external symptoms that puzzle the farmer and cause him to doubt the experience or the integrity of the meat inspector or the fairness of the system requiring condemnation in part or whole of infected carcasses or organs, especially as such condemnations are relatively common and are a matter of practically everyday experience on the part of meat inspectors in large slaughtering establishments. It might be mentioned here, too, that occasionally the inspectors classify as boar meat the carcasses of male pigs in which internal testicles are found. In many cases the farmer claims that the pig was properly castrated, but if the inspector finds one or both testicles located internally, or castration improperly carried out, he has no option (except in the case of pigs less than four months old) but to classify the meat as that of a boar pig for which a lower price is paid.

ISOLATION AND TREATMENT OF SICKLY PIGS.

The first step to take when it is noted that pigs are ailing or are sick is to separate them from the rest of the herd and place them in a comfortable, well-lighted, and well-ventilated pen, or in a yard in which there is a good, clean, and dry shelter shed, free from draughts. For convenience sake this is referred to as a hospital pen. Having separated the patients, next make sure that the bowels are in good working order and that the urine is passed freely and without indications of pain. It is urgent that this be done, for most of the diseases to which the pig is subject are exaggerated by bowel disorders and kidney troubles.

A liberal dose of Epsom salts is one of the best preliminaries in treatment, though it is very difficult to find any better than the good old castor oil with which our parents immediately dosed us as soon as we showed any indication of ill health. In the case of the pig the doses should vary from 1 to 4 oz. of Epsom salts, and from one to four tablespoonfuls of castor oil, the smaller dose being for pigs up to three months old with larger doses for stock carrying more age.

Having taken these steps and having seen to the animals' temporary wellbeing, the next step is to set about improving the conditions under which the remainder of the stock are kept; trying to discover the cause of the illness and to make the necessary arrangements for care and treatment of the sick animals.

No "Cure-alls."

One thing it is desirable to remember is that there are no specific "cure-alls" for the diseases of the pig. The most satisfactory remedy is prevention through strictly observing and regularly practising the rules of health. It may seem irksome to be continually cleaning sties and giving detailed attention to the feeding of pigs, but those who are most successful in this business take much greater delight in preventing disease, by following correct methods of management, than they do by the administration of medicine or other forms of treatment. The compulsory drenching of a sick pig is one of the most unpleasant jobs on the farm.

Preventive measures often entail the use of medicines such as castor oil, but this is best given in the food, especially with sows due to farrow or to stock that have been crated up for several days during long railway

or steamship journeys and who need freshening up as a preliminary to taking up life under a new environment. Drenching by force should be avoided at all times if possible, since it does not improve the temperament of a sick pig, and especially in diseases of the lungs or respiratory passages is distinctly dangerous. In using castor oil the best grades only should be used; other oils such as raw linseed oil, and drugs such as Epsom salts, pig powders, &c., may also be added to the food if the pig has not lost his appetite.

It is preferable to give such medicines in the first feed of the day, while the animal is still very hungry.

THE ADMINISTRATION OF MEDICINE TO PIGS.

How to Use Castor Oil.

To prepare castor oil for use, proceed as follows:—(1) Secure one or two dippers of wheaten bran (for preference), or pollard, cereal meal, or waste bread crumbled up; place in a clean bucket; now measure out the amount of oil to be given and pour it into the dry bran or meal, mix thoroughly, and then, using milk or warm skim milk, reduce the mixture to the consistency of thick cream. Add just enough table salt (say, half a teaspoonful) to disguise the taste of the oil and give with the mash. Compel the animal to take vigorous exercise three or four hours after being dosed, and the result will invariably be satisfactory. Allow ample clean drinking water.

Many medicines can be administered in this fashion, and some others, such as sweet spirits of nitre, may to advantage be added to the drinking water.

Where, however, the state of an animal is such as to make compulsory dosing necessary, it should not be shirked, and the drenching bit or drenching horn (a cow's horn suitably prepared makes a good one) comes into play. Two warnings are necessary here: Drenching apparatus must be scrupulously clean and—never persist in giving a drench to an animal when it is obviously unable to swallow freely. Furthermore, no attempt should be made to drench a pig suffering from diseases of the respiratory passages or lungs, such as bronchitis, pleurisy, &c., since in these diseases the respiratory passages are inflamed and very tender, and if the liquid penetrates into the bronchial tubes serious complications will probably result.

In any case, when an animal is given a drench it must be properly restrained preferably with a strong rope or piece of webbing placed in its mouth behind the tusks and over the snout, the rope being secured to a stout post or rail in such a position that the head can be lifted or lowered in a moment if required.

Do not be in a hurry while drenching. Give ample time for the animal to swallow every mouthful and lower the head at once if there is any indication of coughing or choking.

If the animal weighs less than 100 lb., an attendant, lifting and straddling the animal's back and at the same time grasping both his forelegs, should raise the pig's head high enough to allow the drenching horn to be placed in position. Take plenty of time and give the animal a chance to rest.

At the same time, the animal should be "gagged" by placing a small piece of soft wood between its upper and lower jaw, thus allowing room for a tube or horn to be passed into the mouth. Use a piece of wood not less than 6 inches in length and be sure it is clean and free from splinters.

It is advisable to use a horn with fluids. When a powder has to be given the best method is to make it into a ball with honey or treacle, and if necessary flour. Then using a fairly long piece of wood or a ladle, deposit the mixture on the back of the tongue. If it is placed further forward in the mouth it will almost certainly not be swallowed. Some medicines may be given in pill form.

Pig Powders, Proprietary Medicines, &c.

The author is often asked if he recommends the use of well-advertised pig powders and medicines, salt and bone licks, &c. The answer is invariably that there is no doubt many of these (especially those of long standing and well-established reputation) possess to a greater or lesser extent some healing power and are of value when judiciously used. Some, like salt and bone licks, are very necessary and are certainly recommended, but medicines are quite valueless unless their use is accompanied by a thorough clean-up of the pig premises and by improved methods of accommodating, feeding, and caring for the pigs, and even more important still by strictly culling out all unsatisfactory animals, followed by the introduction of stock carrying better breeding and stronger disease-resisting powers. Stock of low vitality and with weak constitutions are prone to all sorts of trouble and should not be retained on the farm.

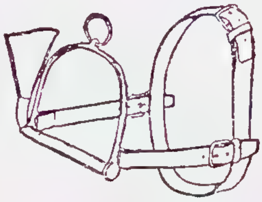


PLATE 83.

FIG. 1.—A suitable type of Pig Drenching Bit of special value to the breeder of valuable pigs. The bit is inserted in the pig's mouth, and the straps are passed round the head at the back of the ears. It simplifies drenching.

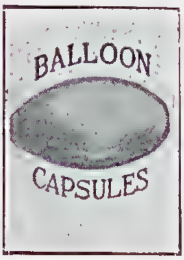


PLATE 84 (Fig. 2)—WORM CAPSULE READY FOR USE.

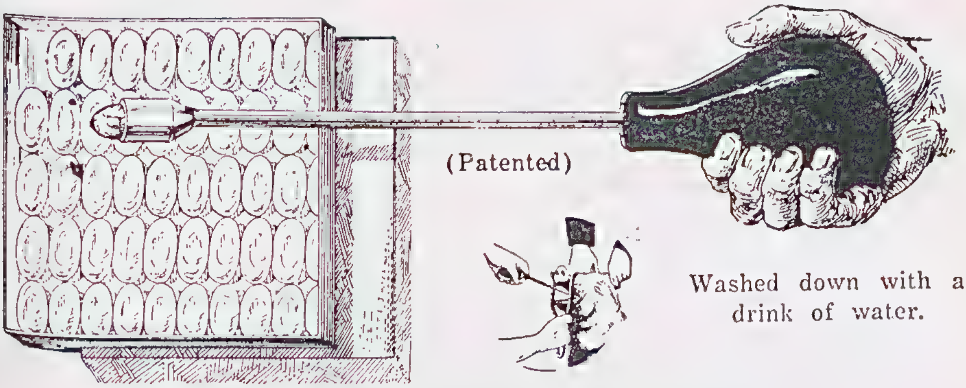


Plate 85 (Fig. 3).—Worm Capsule Outfit.
(Showing patent metal instrument for use in administering capsule, the jaw opener, and box of capsules).

Plate 86.

Fig. 4.—A convenient instrument for inserting into the pig's mouth in order to hold the animal while being drenched or treated. This is a very strong instrument, enabling the operator to handle a heavy sow or boar with comparative ease.

Worm Capsules. (Figs. 1, 2, 3, 4.)

Worm capsules such as are advertised in the Agricultural Press, should contain a full dose of vermifuge (worm medicine) like oil of Chenopodium, Santonin, &c., inside a transparent gelatine covering (the capsule). The special advantages of these capsules are that they are both simple and efficacious if administered correctly. Each capsule carries a stated dose and each pig must be treated separately; thus each pig stands so much better chance of being freed from intestinal parasites. The capsules are usually prepared for animals of varying weights, thus one capsule for a pig weighing 50 lb., two for a pig weighing 100 lb., &c. Repeat doses may also be necessary. Doubtless as time goes on the use of worm capsules will become more general, provided their quality be guaranteed. Some manufacturers supply instruments for use in administering the capsules. Provided the capsules are reasonably priced and of the quality stated, it would be preferable for the inexperienced to depend on them than to attempt drenching an animal about which job they had considerable doubt, especially as capsules may be given in the food. It would, however, be well to obtain Departmental advice before using any remedies of which the farmer has had no previous knowledge.

If the pigs are properly fed and cared for and have ample nutritious food, including greenstuff, there should be no need for the extensive use of pig powders, oils, and similar medicines, but where pigs are sickly and are not doing well and improved feeding and care are not immediately effective, the use of pig powders may be beneficial. It is not difficult to obtain Departmental advice on these matters.

Drugs having as their objective the stimulation of the sexual organs should be used with the greatest caution, and may also be effective in freshening up lethargic animals, but in no instance should dependence be made on the use of sexual stimulants; because healthy, vigorous, well-developed stock should not be in need of artificial stimulants except perhaps during abnormal periods.

Use of Hypodermic Syringe.

Some drugs must necessarily be given with a hypodermic syringe. In muscular and nerve tissue diseases and snakebite where a quick acting drug is called for, it is preferable to have a drug given in this way, but in these cases a qualified official should be engaged to do the work, for an overdose of these specifics is fatal.

Vaccination.

Fortunately pigs in this part of the world are not troubled much with diseases controlled by vaccination and the use of hog cholera serums, mixed infection serums and viruses. The diseases which call for this form of medication include hog cholera or swine fever, swine plague, swine erisipelas, anthrax, foot and mouth disease, and rinderpest. In America, Europe, and parts of the United Kingdom, vaccination appears to have become an absolute necessity.

However, no attempt should be made here to inject serums into pigs unless under strictly official instructions from the State veterinary authorities. It is advisable wherever the owner is doubtful about the nature of the disease from which his animals are suffering, that he should immediately seek the advice of the State officers. With more serious diseases, he is liable to a heavy penalty if he neglects to notify them. Information regarding the nature of various diseases may be had on application to the officers referred to.

Regulations are very strict in all States, so strict as to be regarded by many as irksome; but if the greatest critics of our system could visualise where laxness has led the pig industry in other countries, their criticism would most certainly cease. Rigid supervison has kept us free of most of the ills which afflict stock in other countries. Information as to the regulations controlling import and export of pigs is also available upon application, and should be obtained by all interested in the transport of pigs from one State or country to another.

Rectal Injections.

The enema is often used in the treatment of pigs suffering from acute constipation, stoppage of the bowels, diarrhœa, or other bowel affections. The injection usually consists of warm soapy water to which some form of oil—olive, lucca, salad, or glycerine—has been added. No irritating drugs whatever must be given in this way, otherwise the bowel tissue will be injured. Irrigation of the uterus of breeding sows for diseases of that organ is also to be recommended in certain conditions.

Fumigation.

Here again, where eucalyptus, chloroform, and other drugs are to be introduced through the air passages, it is advisable that veterinarians with a knowledge of the technique of the work be employed.

External Remedies.

These are necessary in the treatment of skin diseases or injuries or for the purpose of freeing the skin of lice or other skin parasites. Spraying is to be recommended in place of dipping if the number of animals to be treated suggests some other form than hand treatment, for wholesale dipping of pigs is by no means an easy task. Dusting with insecticide is well worth consideration, especially with very young pigs. The use of an oiling post to which the animals may go for relief is advised.

PARASITIC INFESTATION.

Internal Parasites of the Pig.

It is essential that the pig breeder should have some knowledge of the various external and internal parasites that infest his stock, and, in this connection, intestinal worms are the most prevalent of those located internally with which he will have to deal.

A prominent overseas author recently stated that more pigs die of intestinal parasites than from contagious diseases. He added that worms cause 90 per cent. of the losses in live stock.

Results of Infestation.

Pigs infested with worms are in just as serious a condition as if affected with contagious disease, though results may not be so apparent or fatal.

Mal-assimilation, debility, &c., from whatever cause it arises, weakens the animal's resistant powers, and makes it a fit subject for attack by internal or external parasites. Animals with sturdy vigorous constitutions are better able to withstand the evil consequences of parasitic infestation than stock less favoured in this respect, the parasites seeming to find their most suitable environment in weakly hosts, this, probably, on account of general debility exercising a depressing influence on the various protective agencies whose function it is to protect the body against infection. Loss of tone in the bowel muscle, by causing constipation, and the retention of poisonous matters in the intestines, also favours parasitic infection; healthy active movement of bowels being opposed to the habits of parasites.

Symptoms of Worm Infestation.

Worms will stunt the growth of the animal, no matter how good the food and care. Though the pig may have a good appetite and eat well, he will, if heavily infested with worms, fail to make headway; his growth will be checked, he will lose flesh, his appetite will become capricious, his skin hidebound and dry and the scurf will flake off in large patches. There may also be a deep "stomach" cough. The animal will rub himself constantly against fences, tree stumps, &c., he will back up and rub his hindquarters against the food troughs, his back will become arched, his flanks tucked up, the nose will be dry and hot, and the eyes glazed, and the throat will be enlarged and "bottle-necked."

Effects on the Pig.

As the disease advances and the parasites become more numerous, the belly will become podgy, the skin hanging over the bones in a dry, tight fashion, and the animal will be inclined to lie in a corner and to

lose heart altogether, he will become anæmic, the mucous membranes will be pale and dull; the bowels are inactive, and sickness gradually overtakes the weakened animal; there may be convulsive pains and colic and finally emaciation may set in, very often with fatal consequences.

The effects of internal parasites on the animal naturally depend upon several factors. The number present is important; in most cases a few parasites in an animal cause no appreciable harm. The age of the pig is another factor influencing the effects of infestation. Intestinal worms cause much more harm to young pigs than to healthy mature animals, and similarly they have greater effect upon stock weakened by lack of suitable foods and vitamines, or by general ill health, or accident. The nature of the food that is given is very important; pigs fed on pasteurised skim milk and similar nourishing foods resist infestation much more readily than offal-fed pigs, or pigs fed largely on dry, fibrous foods.

The manner in which the animal is fed, attended to, and housed, and the amount of green, succulent food he has, are all important factors influencing the resistant powers.

Preventive Measures and Treatment.

In general, to prevent infestation by parasites, the following points should be considered:—

(1) The pigs should be kept growing. The better they are handled and fed the more likely they are to avoid and throw off infestation. Give the young pigs a good start. Old pigs do not apparently suffer much from intestinal worms, but even the old pigs should be well fed and carefully managed so as to keep them in good thrifty condition. Older stock are more subject to infestation by kidney worms than by stomach or intestinal parasites.

(2) Correct feeding of the young pigs may be simplified by arranging separate feeding places so that they can feed apart from the sows. In these places such feed as grain (cracked and boiled or soaked for very young pigs), meat meal, pollard, &c., should be placed, and for preference, each in separate troughs. If these pigs are allowed out on pasture, so much the better, preferably on lucerne, clover, or succulent grasses; skim milk is a valuable addition to the list of foods, and to avoid infection by germs of tuberculosis, the milk should be pasteurised before use.

(3) Free access to charcoal, wood ashes, air-slacked lime, rock salt, may be allowed, these being given "free-choice style," preferably mixed in the form of a mineral mixture and kept in a separate trough, well protected from weather.

(4) Clean pastures and roomy pig paddocks are important. Pastures—grasses and other herbage—are useful, good green lucerne and clover pastures are even better. Succulent pastures are always appreciated, hence the advantages of numerous small paddocks in preference to one or two larger areas.

Ploughing up the old pastures helps wonderfully in getting rid of parasite infestation. Taking the pigs away from the old infected areas and placing them on new pastures and in new pens is to be recommended. Keep the pigs away from infected marshes, slow-running creeks, and stagnant pools.

The provision of a properly constructed concrete bath is a payable proposition. Use some sheep dip or crude oil now and then in this bath.

(5) Do not throw green food out in the mud or on dirty floors. Have a concrete feeding platform and feed them there; keep this platform clean so that the pigs will not pick up infection from dirt; keep the troughs and feeding places free from mud, corn cores, refuse, &c. Use feeding racks for greenstuff.

(6) At all costs avoid using the milk of cows that are suffering from simple or contagious abortion, as it is possible this infected milk may be a primary cause of outbreaks of abortion among breeding sows. All in-pig sows, and particularly those that are heavy in pig, should be carefully housed, as an extra severe frost or a change to cold squally weather may induce abortion. It is believed it often does. The use of musty, mouldy foods and of weak, washy swill is decidedly dangerous.

(7) Drainage is necessary. Keep the pens as dry as possible. Diseases and parasites are always more plentiful in wet seasons and on low swampy areas of ground than on high and dry building sites or in dry, hot seasons.

(8) The life history of parasites should be studied. Study schemes that will evade the worm, the worm eggs, and the embryos at all stages in their life hstory.

(9) Use properly compounded worm remedies; Santonin and calomel are good. The dose is about 5 grains of each to a 100 lb. weight pig. For a 200 lb. pig increase to 7½ grains, and for a 300 lb. pig 5 to 10 grains of each of these drugs. This is called an emergency treatment, and may be given to wormy pigs with advantage.

(10) Feed lightly for two days following, then give a good purge of 3 to 4 oz. of castor oil. Repeat in a fortnight if the animal has not improved on good feeding. The doses given are for a full-grown pig; if treating a baconer or a porker, give about two-thirds of a dose to each animal.

(11) An American recipe which has proved very successful is as follows:—Mix together Santonin, 5 grains; areca nut, 3 drachms; calomel, 3 grains; sodium bicarbonate, 1 drachm. The ingredients should be thoroughly mixed. The quantity named constitutes a dose for a 100-lb. pig. Use twice as much for a 200-lb. pig, slightly more for a 300-lb. pig. Feed should be withheld for at least eighteen hours before giving the above mixture, which should be mixed in a small mass of pollard or else as a drench in warm milk. Repeat the dose in eight to ten days to make sure that all worms are expelled.

(12) Another useful farm recipe is:—Turpentine, half to one tablespoonful; linseed oil (raw), two to four tablespoonfuls. Mix well together, and give as a drench in a small quantity of milk, and follow with a dose of castor oil, this for a full-grown pig, half this quantity for a pig of bacon size.

(13) Powdered areca nut given in the same way in 1½ to 2 drachms doses is also very good. See also references to the use of worm capsules in the paragraphs dealing with administration of medicine to pigs.

INTESTINAL WORMS.*

Internal parasites of the pig that have so far been recorded from Australia may be classed as follows:—

Intestinal Worms.

Ascaris lumbricoides (Lin.). The Long White Worm.

Ancylostoma duodenale (Dub.). Hookworm.

Necator americanus (Stiles). Hookworm.

Macracanthorthynchus hirudenaceus (Pallas). Thorn-headed Worm.

Oesophagostomum dentatum (Rud.). Nodule Worm.

Oesophagostomum longicaudum (Goodey).

Trichuris trichiura (Lin.). Whip Worm.

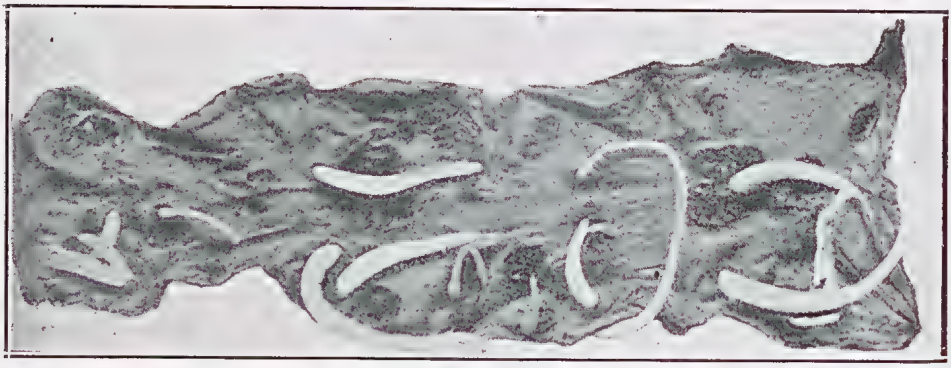


Plate 87.

Fig. 5.—Portion of pig's intestine, showing Thorn Headed Worms attached to the mucous membrane of the intestines. The worms illustrated were much shrivelled and immature when this photograph was taken.

Stomach Worms.

Arduenna strongylina (Rud.).

Physocephalus sexalatus (Molin).

Hyostrongylus rubidus (Hassal and Stiles).

Gnathostoma hispidum (Fedch).

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* The author is indebted to Mr. F. H. S. Roberts, M.Sc., Veterinary Parasitologist, for a revision of this section of the Diseases pamphlet, also for supplying the names of the various pig parasites.

The illustrations (Plate 88, Figs. 1-2, Plate 89, Figs. 1-5*b*) are the work of Mr. I. W. Helmsing, Illustrator, also of the Entomological Branch, Department of Agriculture and Stock, Brisbane, Queensland.

Lung Worms and Worms Infesting Other Organs.

Metastrongylus apris (Gmelin). (Lungs.)

Chaerostrongylus pudendotectus (Wost). (Lungs.)

Echinococcus granulosus (Botsch). (Lungs, liver, &c) Hydatids.

Cysticercus tenuicollis (Omenta and mesenteries). Water-ball.

Stephanurus dentatus (Dies). (Perirenal tissue, liver, and lungs.) Kidney Worm.

Fasciola hepatica (Lin.). (Liver.) Liver Fluke.

Thus of the fifty-two internal parasites recorded by Baylis as being found in the pig, seventeen have been found in Australia. The most plentiful parasite appears to be the kndney worm, *Stephanurus dentatus.* The percentage of infestation by *Ascaris lumbricoides* is also fairly high, whilst that of the thorn-headed worm, *Macracanthorthynchus hirudinaceus,* and the stomach worms, *Arduenna strongylina* and *Physocephalus sexalatus,* appear, from the information available, to be slowly increasing. The lung worms and whip worms (*M. apris, C. pudendotectus,* and *T. trichiura*) are somewhat rare, whilst the nodule worms *Oesophagostomum* sp. in the pig have yet to be encountered in this State. Australia is fortunate in that the intestinal parasite *Trichinella spiralis* is as yet unknown here. This worm is the cause of that serious disease "Trichinosis." Another worm whose infestations are very common abroad and unknown in Australia is the *Cysticercus cellulosæ,* the cause of pig measle.

The Long White Worm.

(See Plate 88, fig. 1.)

The common round white worms (*Ascaris lumbricoides* (Lin.) are found in nearly all pigs, and occasionally are present in such numbers that portions of the intestines are choked with them as they lie bunched together. They prefer to live in the small intestines, but may also be found in the large bowel, the stomach, the bile ducts, while they have even been found in the œsophagus (the food pipe carrying the food from the mouth to the stomach).

These worms are round in shape, tapering at both ends, are white or yellowish in colour, and have a smooth clear skin. The female is the larger, and is 9 to 15 inches in length; the male is shorter and stouter, and measures 4 to 9 inches in length.

The life history of the Ascaris is now known to be very complicated. The eggs must pass from the body of pig and after passing, if conditions of temperature, moisture, &c., are favourable, hatch in from ten to fourteen days. The young larvæ are swallowed with food, water, &c., and in the case of young pigs from the teats of the mother infected with worm eggs from being in contact with the infected soil of pen. They reach the intestines, make their way into blood vessels, and are carried to lungs. Here further development proceeds until the young worm is coughed up and swallowed, reaching intestines again where they grow to maturity. It is worth stressing that there is grave danger of the young pig becoming infected by sucking the teats of a sow whose udders might be covered with eggs and larvæ picked up in dirty pens.

The worm eggs may be distributed in shallow pools, water troughs, or in old straw heaps; it is safe to say that every pig more than a few days old may thus become infested if worms exist in the herd.

Strict sanitation and immediate attention to the treatment of all affected pigs is strongly advised.

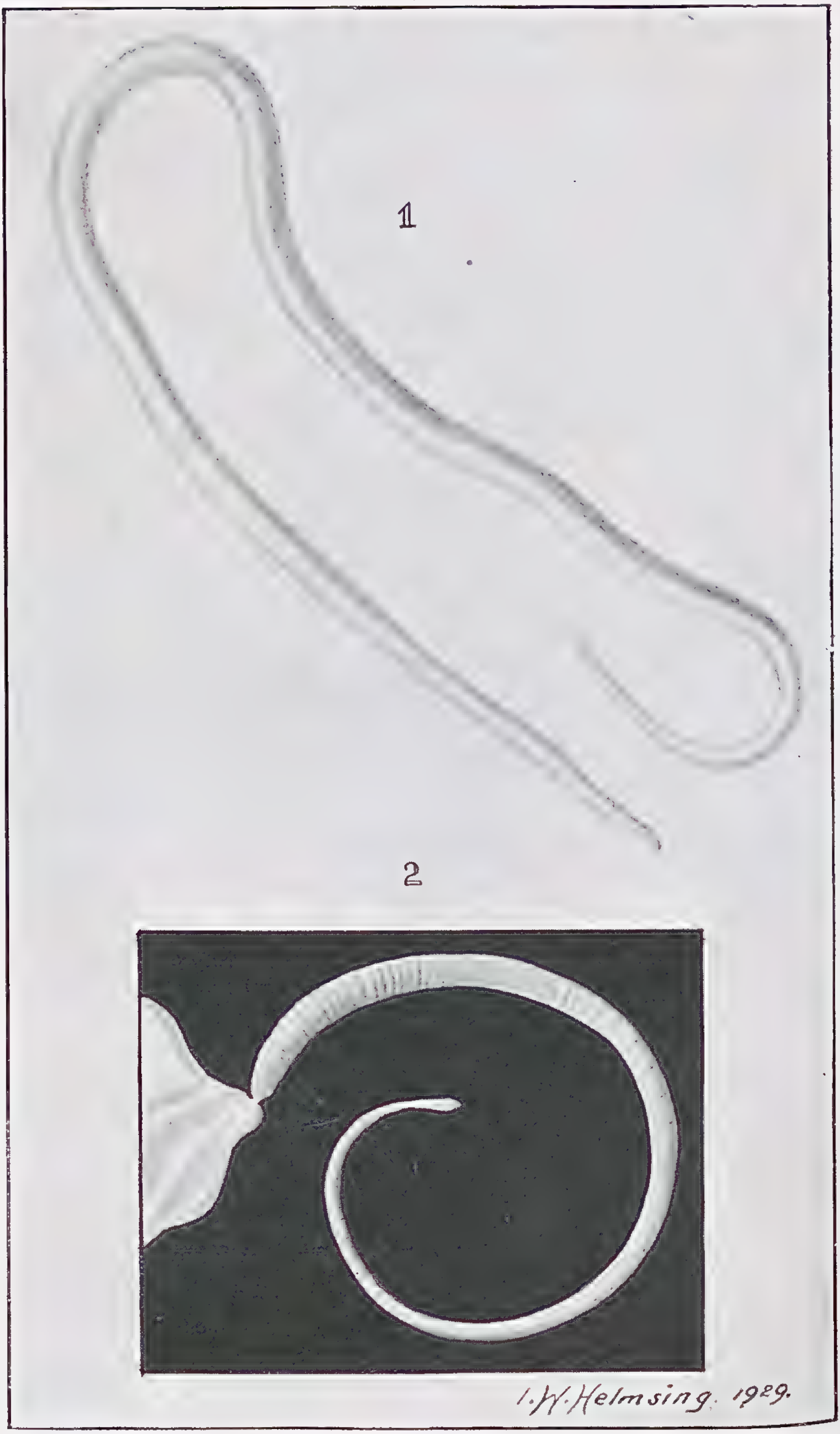


PLATE 88.

Fig. 1.—Long Round White Worm (*Ascaris lumbricoides*), natural size.
Fig. 2.—Thorn-headed Worm (*Macraeanthorthynchus hirudinaceus*), natural size.

The Thorn-headed Worm.

(See Plate 88, fig. 2.)

This is also an intestinal worm usually found in the small intestines of pigs. Sometimes it is also found in the large intestines. It is quite frequently found associated with round worms, but usually, in Queensland, only a few thorn-headed worms are found in infested animals. They are a round worm, but are more slender and usually shorter than the Ascaris, and are milky white in colour.

These worms have a powerful armed proboscis with which they fasten themselves to the intestines. They do not suck the blood, but take their food directly from the intestinal contents.

The female lays her eggs in the intestinal tract where they become mixed with the contents and are then passed out with the fæces. These eggs are too small to be seen with the naked eye. The next stage in their life history is when they are swallowed by a species of beetle or its larvæ frequenting the manure of the animal. A few days following this, these eggs hatch out in the digestive tract of the insect and then find their way to the abdominal cavity. The pig in rooting about finds these insects and eats them. Thus the parasites find their way into the stomach of the pig, where they are released by digestive processes and are soon fully mature. These worms do considerable damage when present in large numbers, for they burrow into the intestinal wall where they produce inflammation, and in some instances have been known to produce abscesses and perforation of the bowels. The worms do not remain attached to one place very long, but move about in the intestinal tract, causing a number of inflammatory areas.

When these worms are present in considerable numbers the animal suffers from general unthriftiness, loses weight, has an irregular appetite, and may be constipated at first, suffering later from diarrhœa. The animal may show signs of nervousness, and the muscles of the head and neck may jerk or twitch; at this stage convulsions may take place, and if so, the animal usually dies.

The only way to deal with these worms is to prevent infestation by keeping the pigs on areas that are not infested with these beetles and their white grubs; these are frequently found in old manure piles and in decaying timber and rubbish. General sanitary measures are strongly recommended. The same treatment is recommended for prevention of long white worms. No worm medicine should be given unless the animal has been fasted for at least eighteen to twenty-four hours; this allows the medicine to work on an empty stomach and in an intestinal tract not overloaded with food. Medicinal treatment is not likely to be as effective in the case of thorn-headed worms as it is where *Ascaris lumbricoides* is present alone.

In addition to the preventive measures referred to above, it is suggested as a further means of preventing infection that sows about to farrow be placed in a clean pen. Young pigs born under these conditions have a better chance of keeping free of infection during their early growth when heavy worm infestation may have fatal results.

The Lung Worms.

The lung worms (*Metastrongylus apri* and *Chacrostrongylus pudendotectus*) are not as common in pigs in this country as abroad, though they are occasionally found and are probably spreading into new districts

every year. They infest the bronchial tubes and air passages which abound in the lungs, and are a source of much irritation and annoyance to the affected pig.

The lung worm is a delicate white or brownish coloured thread-like worm, in length from one and a-quarter to one and a-half inches. The male is slightly shorter than the female, and the headpiece is provided with a sucking apparatus by means of which it is possible for the worm to cling to the mucous membrane. The entire life history of the lung worm is not well known, but it is evident that the eggs are passed out in the mucous discharges from the nostrils and the mouth; they may also be swallowed by way of the mouth and be passed out in the discharges of the bowels. The eggs often find their way into the ground, where, with sufficient warmth and moisture, they hatch out and are taken into the intestines with food, &c., and from there enter a blood vessel, and eventually find their way to the air passages and lungs. Lung worms are responsible for the disease known as verminous bronchitis.

It is not known how long the eggs may remain dormant or how long the newly-hatched worm can live before an opportunity offers for their being carried back to the air passages of a new host. Pigs infested with lung worms will suffer severely if the worms are present in large numbers, but if only a few are present, they may not be noticed. Young pigs are more likely to suffer than mature animals. Affected pigs usually cough very much after rising in the morning or after taking food or exercise. This cough is the result of irritation of the mucous membrane. Unthriftiness and emaciation would follow if the animal were severely infested. There is no reliable method of treatment, as the pig is not an easy patient when it comes to fumigation by inhalation, hence preventive measures with careful housing and feeding must be relied upon in the battle against lung worms.

Overseas Experience.

In an interesting report on "Some Parasitic Diseases of the Pig," by Professor Basil Buxton, M.A., F.R.C.V.S., in the Pig Breeders' Annual, emphasis is laid on the economic importance of diseases of the pig. Professor Buxton also makes an excellent point when he refers to the drastic measures that are adopted by Government officials in Great Britain, in the case of an unfortunate outbreak of Swine Fever or Swine Erysipelas, while little attention is paid to the more insidious, although equally important, broncho or gastro intestinal parasites.

He adds that the common "Lung Worm" of the pig (*Strongylus paradoxus*, sometimes also referred to there as *Metastrongylus apri*), is responsible in some districts for serious losses among young pigs. The irritation caused by these parasites results in bronchitis and later in pneumonia. The lung worms are whitish or brownish white threadlike parasites, varying in length from one to one and a-half inches. The eggs contain active embryos and these probably hatch in the lungs, and are carried out in the mucus discharged by coughing or may be voided directly or be swallowed and passed out with the fæces. Many pigs are doubtless infected through their drinking water.

Treatment for lung worms is a much more serious business than for intestinal worms; hence competent aid should be called in to handle the case and advise as to the best forms of medications.

The Kidney Worm.

(See Plate 89, figs. 1 and 1a.)

Kidney worms, technically referred to as *Stephanurus dentatus*, Dies. are now one of the most persistent parasites of the pig, though, until recent years, they were comparatively rare and in many parts of Australia were unknown, but during the last twenty years they appear to have spread with surprising rapidity and now scarcely a district could be named in which infected pigs could not be found. The worms are quite characteristic and distinct; being mottled in colour, similar to brown or light tortoiseshell, the male growing to about an inch in length, and the female slightly longer.

The kidney worm makes its habitat in the abdominal viscera, especially in the fatty tissues surrounding the kidneys and in the fatty tissues of the intestines, stomach, liver, and other organs where it may cause abscesses varying in size, and in the pus of which the worms may be found singly or in pairs or more. These abscesses are usually soft and spongy and if the worms are plentiful may be extensively distributed.

Individual pigs do not appear to be infested with any great number of parasites. The affected kidney will be much enlarged; there may be a quantity of creamy pus in the pelvis (or internal cavity of the kidney), or this may have developed into an abscess. The worms will invariably be found in the tissue, and in the case of the ureters* they may be found floating in the pus. In the fatty tissue (the flare or kidney fat) the worms may be numerous and can at once be observed by their peculiar (mottled) colour and form.

There is no other worm infesting the pig that could be mistaken for the kidney worm. It is difficult to understand how they reach their favourite haunts, but their life history shows that the female lays eggs that are passed out in the urine and are thus deposited on the pastures where, under favourable conditions of temperature and moisture, they hatch within twenty to thirty-six hours, and within about a week they reach the infective stage, and are ready to start work in susceptible pigs that might swallow them in food or water. In this way they enter the intestines and eventually reach the kidneys or the fatty tissues surrounding these areas. It is apparent that the eggs and larvae are both susceptible to low temperature and drying. Some authorities state that, on hatching, some of the larvæ are taken in with the food and others bore through the skin, the organs affected being dependent upon the method of infection.

When the deep-seated position in which these worms lie is remembered, it will be seen that treatment is a very difficult matter; in fact, it is impossible to rid the animal of them by direct treatment. Ordinarily there is no way during life of determining when an animal is infested, except by microscopic examination of urine, fæces, or infested soil; and if any symptoms were present that would indicate their presence it would be problematical whether treatment would be of any value. Pig breeders should make a point of striving by strict sanitary methods to keep out parasites of all descriptions and to be extremely careful when buying fresh stock to see that they come from clean herds and are

* The ureter is the duct through which the urine flows from the kidney to the bladder. The urethra is the canal or duct through which the urine flows from the bladder.

PLATE 89.

isolated from the rest of the pigs for at least three weeks. It must further be remembered that a pig in good condition is better able to resist these parasites than would be the case if poorly fed and attended to.

Kidney worms cause an ever-increasing economic loss in organs or parts thereof condemned, although normal carcasses that are infested are not usually reduced in value, nor are they subject to condemnation by meat inspectors if they are otherwise in marketable condition.

Kidney worms are reputed to be the cause of partial paralysis of the hindquarters of pigs, but this is by no means certain, though a pig infested with kidney worms must suffer a good deal of inconvenience and probably pain, and in this way might be predisposed to conditions responsible for paralysis.

The Whip Worm.

The whip worm (*Trichuris trichiura*) is a tiny, whip-like white worm found in the coecum and colon. In size they vary from one and a-half to two inches. The anterior portion of the body is thin and threadlike and the posterior portion is quite stout. The whip worm buries its long head in the mucosa whilst the heavy body floats freely in the lumen of the large intestine. They feed upon the blood and other nutritious matter absorbed from the spot into which the mouth is buried. The life history is simple, reinfection occurring when the eggs are taken into the stomach. Here they hatch and the young larvae quickly reach the coecum where maturity may be attained in sixteen to twenty days.

This worm is not often found in pigs which are kept in cleanly sanitary surroundings; like the round worm it thrives on farms where there is neglect. The eggs are very resistant and may live for years before losing their vitality. As with the round worm good sanitary conditions are most desirable, as owing to its location, it is very difficult to reach the whip worm with any vermifuge.

PLATE 89.

Fig. 1. Kidney Worm, x 2¾.

Fig. 1*a*. Kidney Worm, natural size.

Fig. 2. Hook Worm, x 7.

Fig. 2*a*. Hook Worm, natural size.

Fig. 3. *Arduenna strongylina,* x 8.

Fig. 3*a*. *Arduenna strongylina,* natural size.

Fig. 3*b*. *Arduenna strongylina,* anal extremity.

Fig. 4. *Necator americanus,* x 8.

Fig. 4*a*. *Necator americanus,* natural size.

Fig. 4*b*. *Necator americanus,* anal extremity.

Fig. 5. *Ancylostoma duodenale,* x 8.

Fig. 5*a*. *Ancylostoma duodenale,* natural size.

Fig. 5*b*. *Ancylostoma duodenale,* anal extremity.

ADDITIONAL INTESTINAL PARASITES OF PIGS.

Ancylostoma duodenale Dub. (hookworm). Pl. 89, figs. 4, 4a, and 4b.
Necator americanus Stiles (hookworm). Pl. 89, figs. 5, 5a, and 5b.
Oesophagostomum longicaudum Goodey (nodule worm).
Oesophagostomum dentatum Rud. (nodule worm).

The first and second are the common hookworms of man which were recorded for the first time in Australia by Doctor John Legg, B.V.Sc., M.R.C.V.S., Government Veterinary Surgeon, Townsville, and Mr. J. Rheuben, Slaughtering Inspector, Department of Agriculture and Stock. A further description of these worms with photos will be found in "Neuman's Parasites," second edition, available at leading booksellers.

Hookworm attach themselves to the duodenum of the pig (portion of the intestines) in thousands, and that portion of the bowel being rich in blood vessels it will readily be seen how infestation results in an animal becoming emaciated as these worms feed on the blood. It is not known at present to what extent these parasites infest Australian pigs, for they have not been reported on extensively. Likewise, it is not known whether their presence in pigs results in any serious disorders apart from the condition already described. Doubtless, more will be heard of them in the future as extended research makes it possible to locate more the species. These worms have also been reported on by Dr. Georgina Sweet, Melbourne, Victoria, a noted authority on Animal Parasites.

The two species of *Oesophagostomum* inhabit almost exclusively the large intestine giving rise to the condition, more familiar to sheepmen and caused by a somewhat similar worm in sheep, known as pimply gut. The nodule worm of swine is a small white or grey worm, varying from half an inch to an inch in length, the female being the larger. Fortunately these worms are comparatively rare, and when infestation is light may do no damage to the older animals. In young stock the nodule worm is suspected as being responsible for intestinal irritation, unthriftiness and anaemia, and is also believed to be a contributing factor to peritonitis.

The life history is direct, the eggs being passed out with the fæces. Here they hatch and feed on the foecal matter for a short while and gradually grow into the infective stage. This stage is taken in by the pig with food or water eventually reaching the large intestine.

Treatment is difficult and is mainly concerned with prevention, by keeping the pigs under sanitary conditions.

Stomach Worms.

Of the four stomach worms recorded, *Arduenna strongylina* (Pl. 89, figs. 3, 3a, and 3b) and *Physocephalus sexalatus* appear the most important. These are small whitish to reddish worms usually found together and occupying the pyloric region of the stomach and upper small intestine. In size they may vary from three-fifths to seven-eighths of an inch. Pigs heavily infested with these worms will give evidence of thirst, restlessness and do not feed well. These parasites have a life history somewhat similar to the thorn-headed worms—various beetles playing the part of intermediate host, the pig being reinfested by eating these insects.

One American writer (Kingsley) states that *Arduenna strongylina* is a very common parasite in the stomach of swine. It is possible that at least 90 per cent. of swine are infested with these parasites. He also states that the *Simondsia paradoxa* infests the stomach of swine, but is probably not common in the United States of America, although quite prevalent in some sections of Europe.

Gnathostoma hispidum (Pl. 89, figs. 2 and 2a) has been recorded once only, from far Northern Australia.

Bladder Worms.

These are the larvae of various tapeworms which in the adult stage inhabit other animals. The most common bladder worm found in pigs is called *Echinococcus granulosus,* better known as hydatids. The adult of this tape worm lives in the dog. *Cysticercus tenuicollis* is more familiar to the sheepman. The so-called water-ball as known to slaughtermen being this larva. The adult, *Taenia hydatigena,* also lives in the dog. Hydatid cysts are usually found in the liver and lungs, whilst *Cysticercus tenuicollis* inhabits the omenta and mesenteries. Treatment in these cases consists in preventing pigs from eating the fæces of dogs, for in the fæces the eggs of the adults are to be found. Similarly dogs should not be given pig offal, as this would allow the ingestion of these larvae which would eventually reach the adult stage in the dog and become a further source of infection.

Cysticercus cellulosae, the cause of pig measles has not yet been recorded in Australia. The adult of this bladder worm is known as *Taenia solium,* and its host is man. Infection of the pig occurs through allowing these animals access to human fæcal matter.

In pickling hams and pork and using a pickle pump to inject the thicker portions of the meat, it sometimes happens that gas or gas-forming bacteria are introduced which produce in the hams or bacon a peculiar bladder-like condition in the tissues (fatty) between the muscles and also in the connective tissue, and these at first sight resemble in appearance measly pork, but a careful examination will reveal the true condition.

Fasciola hepatica L. is most usually found in sheep, but has been recorded from both cattle and pigs. Although in New South Wales it is very prevalent among sheep in certain districts it has not been reported in any numbers from Queensland. The pig may be termed an accidental host, and in this State there is only one record of this animal acting as a host.

PREPARATION OF SPECIMENS FOR VETERINARY OR BACTERIOLOGICAL EXAMINATION.

If it is desired to forward to the Department of Agriculture and Stock specimens of diseased organs or parts, plants or seeds suspected of being poisonous, &c., for examination, it would be well to observe that by attention to the following instructions specimens for examination should arrive safely for investigation:—

Every specimen should have attached to it a label clearly written or printed indicating the sender's name and full postal address, the nature of the specimen submitted and from what animal or source obtained.

Small morbid specimens, including tumours, suspected tubercular growths and internal organs, should be forwarded in a sealed bottle, and preserved with either of the following:—

One part of commercial formalin to four parts of rain water.

Equal parts of methylated spirit and rain water.

Neither the methylated spirit nor the ordinary salt solution are as satisfactory as the formalin; the latter may be purchased at chemist shops at a very nominal cost.

The bottle should be well wrapped with plenty of old cloth or rags, packed securely in a tin container and sent by rail.

Large specimens are best surrounded with coarse salt, packed in a box, and railed immediately by most rapid route.

Internal parasites (worms) may be preserved in a small bottle containing equal parts of methylated spirit and water or formalin as above stated, and must be carefully packed and be sent by post.

External parasites, such as ticks, lice, &c., should be forwarded in the living condition in a tobacco box, securely packed with plenty of paper wrapping, with address and contents clearly indicated.

Blood Smears for Examination.

In some cases these afford valuable information. All that is required is to smear the merest trace of blood on one side only of a small piece of flat clean glass—thin window glass about 1 inch long and 2 or 3 inches wide. The blood film should be smeared once only and as thin as possible.

In suspected lung trouble the whole suspected lung, packed in formalin solution, should be forwarded.

There are usually no charges for examination of specimens but detailed advice *re* this could be obtained on application.

Specimen of grasses, &c., may be forwarded in a partially dried form; the specimen to include root, stem, leaves, flower or seed. If specimens are forwarded wrapped in blotting paper (clean) it would prevent development of mould. Seeds may be forwarded in any suitable container and should be packed in clean cotton wool.

In all cases forward to the Under Secretary, Department of Agriculture and Stock, Brisbane, advising by letter, 'phone or wire in ample time beforehand, so that arrangements may be made for examination prior to receipt of specimens.

AN INTERESTING JOURNAL.

A Mudgeeraba farmer, in appreciation of valuable assistance received from the Department of Agriculture and Stock, and also of the usefulness of this journal, writes (11th August, 1930): " . . . I might say that the 'Queensland Agricultural Journal' is the most interesting paper a farmer could have . . .''

TOMATO CULTURE.

By Officers of the Fruit Branch, Department of Agriculture and Stock.

In recent years the production of tomatoes has materially increased, but taken as a whole it is doubtful whether the increase is proportionate to the larger area under this crop. Various factors have operated against the continuance of high yield, of which constant cropping of the same land is not the least important. The lack of efficient soil treatment, the introduction and establishment of disease in addition to such as may have already been established, and frequently insufficient attention all militate against high averages. It must also be admitted that the land cropped is not always of a nature best suited for tomato culture. These matters and points on grading and packing are discussed in these notes.—ED.

SOIL REQUIREMENTS.

A FINE alluvial loam with good fertility and efficient drainage is considered the most suitable, though excellent crops are also obtained from basaltic soils. Continuous cropping of the same land is not in any circumstances recommended; in fact, alternate sowing with green crops to plough into and maintain the supply of humus in the soil are necessary and will, in addition to maintaining the desired element in the soil, assist in retaining such fertilisers as are applied. Whatever green crops are used, the choice of variety depends upon local conditions. It should not be subject to eelworm or nematodes; therefore cow pea could not be recommended.

Maize sown broadcast and fairly closely provides a liberal supply of vegetable matter and is now receiving more general attention in this line. It will be found advantageous to apply the necessary fertiliser before planting the green crops so that a luxurious growth may be ensured; the fertilising elements which have been absorbed by it will be returned to the soil when it is ploughed under.

Ground that becomes sodden in wet weather becomes rapidly hard and dry after rain. Where a small plot, generally referred to as a soak, exists it may, according to the situation, be worth while draining it with agricultural pipes, but draining large areas is not profitable.

Good preliminary cultivation is most essential. Land which has not been under cultivation previously or is deficient in any or all of the plant foods should be liberally fertilised. Unfortunately, farmyard or stable manure is rarely available in sufficient quantity (its deficiency is responsible for much ploughing under of cover crops to provide the necessary mould); consequently other fertilising material must be applied, and the following formula is recommended:—1 to 1½ cwt. sulphate of ammonia, 5 cwt. of superphosphate and 1½ to 2 cwt. of muriate (or sulphate) of potash per acre. These should be thoroughly mixed, spread evenly over the soil, worked into, and thoroughly incorporated with it.

Planting.

Planting is usually done in rows and the plants subsequently allowed to grow at will, practically covering the soil surface. Staking with or without wiring is seldom practised, the extra labour not being considered warranted, but this is open to question, particularly where the available land is limited. The distance between plants ordinarily varies according to soil and local conditions from 4 feet to 8 feet, or even more according to local conditions. Where grown with the aid of stakes (with or without wires) they may be planted 18 inches to 2 feet apart, and 3 feet between the rows. The plants are trained to a single stem from the outset, all laterals being removed close to the stem without injuring the main foliage and the terminal bud removed when the height of the support has been reached, the plant being trained vertically; all parts are accessible to applications against fungi or insect pests. Where stakes are plentiful and light, one to each plant is used, 4 feet to 5 feet being allowed above the ground level, the plants being tied to them in three or four places before reaching the top. By the use of fairly heavy posts sunk well into the ground at distances of about 30 feet apart wire may be used. These may be kept in position by "droppers" reaching a short distance into the soil. The advantages of this system are that clean cultivation can be much more readily

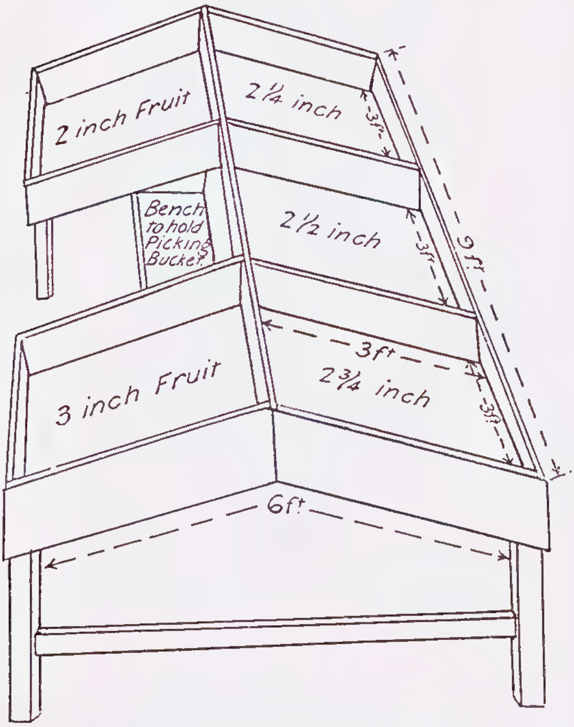


PLATE 90 (Fig. 1).—SIZING TABLE.

Diagram of sizing table containing bins for five sizes of tomatoes, and a space with bench built in to accommodate sizing hand.

Note.—This table should not be made too big, as this will cause rough handling of fruit.

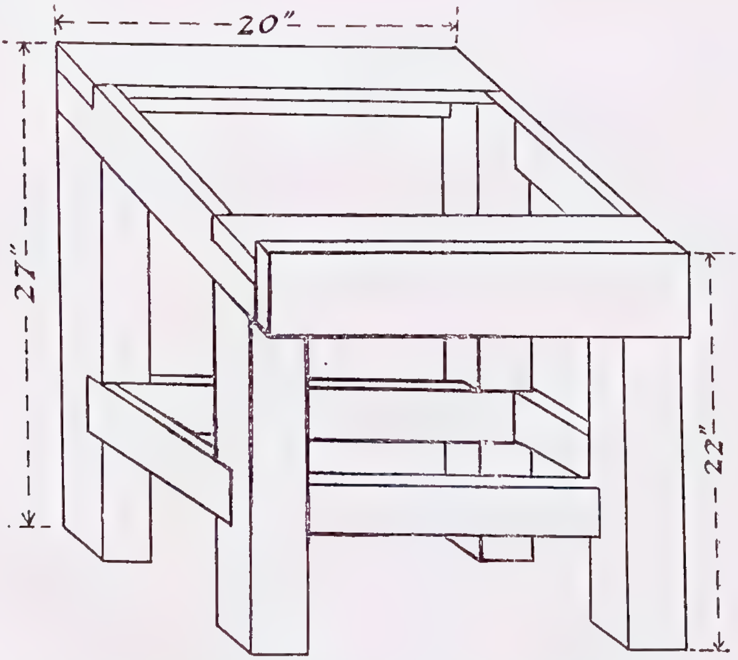


PLATE 91 (Fig. 2).—PACKING BENCH.

Diagram of a useful packing stand—height in front, 22 inches; height at back, 27 inches; distance from front to the back, 18 inches; legs, 3 inches x 3 inches; stays, 3 inches x 1 inch; front board, 5 inches x 1 inch. This stand should be made wide enough to hold two cases, thus permitting two counts to be packed at the same time from the sizing table.

practised; moisture is retained by lightly working the surface soil, and where necessary attention is given, practically no losses from blight nor caterpillar, also very much increased yields, in some instances over 100 per cent. are recorded.

Varieties.

As to varieties, preferences differ in every district, and no list of suitable varieties for all districts can be submitted. This is particularly instanced in the wilt-resistant properties claimed for Bowen Buckeye in the district of its origin, while under trial with a collection of other kinds a Hawkesbury proved to be the most susceptible to the disease. Growers have been advised repeatedly to save their own seeds from selected plants showing a combination of vigour, productivity, and even-shaped fruit of medium size. Excessively large fruit is generally prone to irregularity in shape, is seldom so freely produced, and for general purposes is not so much in demand as fruit of medium size. It is disappointing to note how few have accepted this advice, and it is a common practice to purchase imported seeds and to a lesser extent import seed direct from oversea. To lack of discrimination in this respect, the wide distribution of the ills which beset the plants are in a great measure responsible. As the tomato thrives so vigorously in this State it is reasonable to assume that an all round improvement could be effected by selection, for it will be noted that odd plants in a plot show marked advantages over others in their vicinity.

Much has been said in favour of the wilt-resistant varieties, among which Norton has not been superseded. Such varieties are, however, not so widely sown as one would expect, and the inference is that they are not considered as profitable as those for which no such claims are made.

Raising the Plants.

Diversity of opinion exists as to the advantages of planting the seeds in the position where the plants are to remain. The practice may present disadvantages in districts of light rainfall, but under ordinary conditions it has a most important feature to commend it. In transplanting no matter how careful the operation, many roots are broken and where such breakages occur an opening is made for the entry of injurious bacteria. Where seed-beds must be provided the same site should not be used for two seasons in succession.

Shade is sometimes necessary to secure even germination, and this can be obtained by the use of straw or even bags laid upon the ground in which the seed is planted, the covering being removed as soon as the young plants begin to appear through the soil. Before planting the seed the soil should be reduced to a fine tilth. That is important. Following planting the soil should be firmed either by beating with the back of a spade or shovel or completely treading it. A fine light layer of loose soil should then be scattered over the surface. In the absence of firming, the soil will frequently dry to a sufficient depth to prevent germination, even when watered daily.

Plants grown close together as seedlings in the seed-bed usually draw freely on the available moisture, and if this is not present make poor growth. An even and adequate supply of moisture is therefore necessary to develop robust plants, but for a day or two prior to transplanting (unless it should be during showery weather) watering should be entirely suspended.

In the field the land should be well prepared; deep working will assist the plants to withstand dry weather, and cultivation while it can be practised (throughout where staking is employed) will also materially help.

It is, unfortunately, a rather common sight to see rejected fruit scattered over the field where it decays, and in the process provides a medium for the development and spread of diseases and pests. Instead of the old stalks, and as far as possible the foliage, being collected and burned as soon as the plants become unprofitable they are left until some later date and then more or less ploughed into the soil.

MARKETING TOMATOES.

Much has been written on the subject of marketing different fruits, but the essential facts are still the same; grading, sizing, packing, and an attractive get-up to the finished package are the things that count. The grower must study the needs of the consumer, retailer, and agent to get the best price for his product.

Consumers want tomatoes of good quality and in a condition that will induce them to buy more, so increasing the demand and disposing of greater quantities. Immature, small, or grubby fruit are not appreciated, and many of the householders getting fruit of this description from the retailer cease to buy tomatoes for a week or so, thus causing an over-supplied market, with the consequent drop in prices.

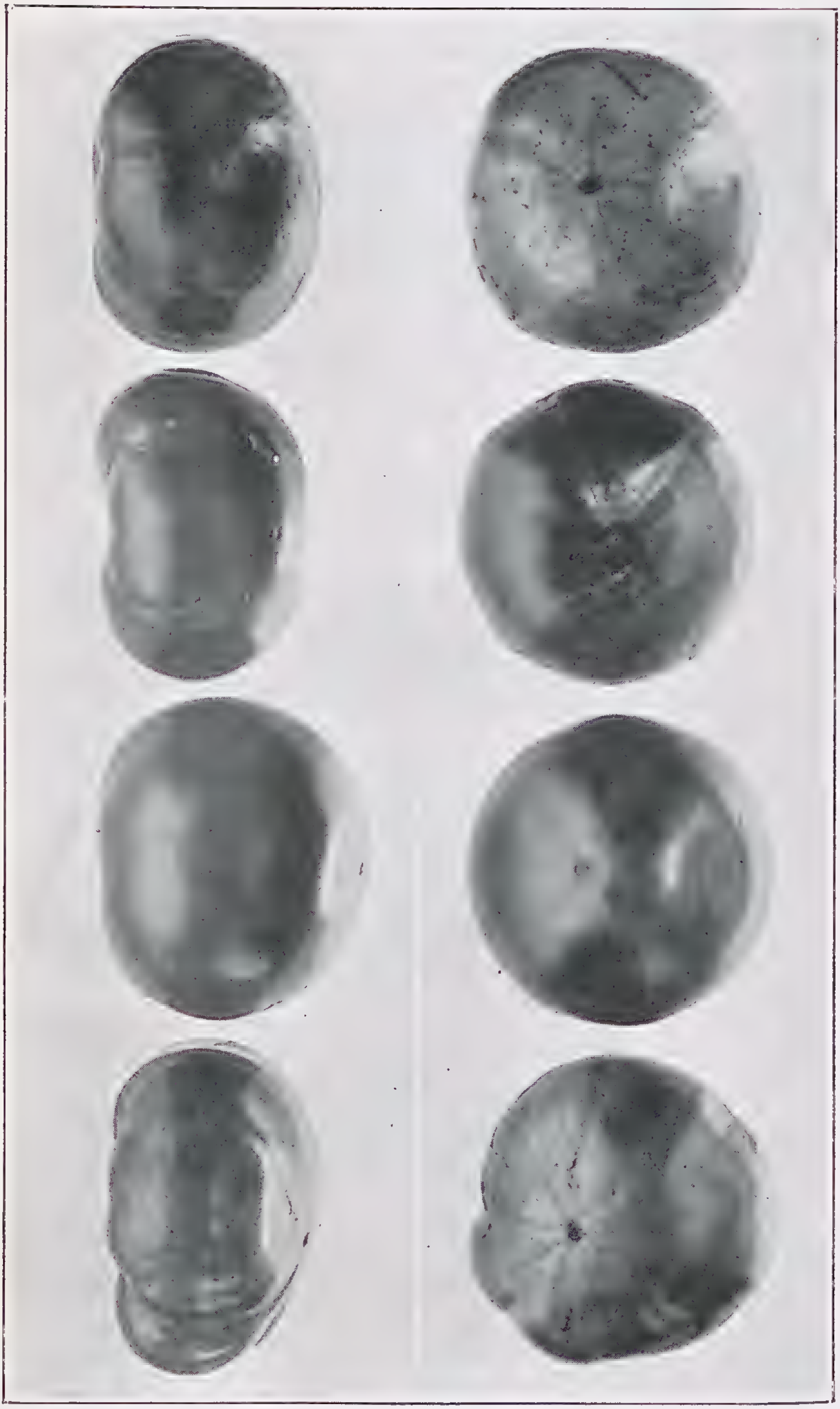


PLATE 92 (Fig. 3).

Four specimens of tomatoes photographed on edge and on the flat, showing the uneven layer which would be obtained with tomatoes packed on the flat, and the even layer obtained by placing the fruit on its cheek as is done when using the Standard Cheek Pack.

These were four tomatoes taken from a case in the market measuring $2\frac{5}{8}$ inches in diameter.

Retailers require tomatoes of a uniform quality to enable them to sell, if possible, 100 per cent. of good, sound, unblemished fruit, thus satisfying their customers and keeping up a demand.

Growers should remember that a good agent to handle their fruit is necessary, but the more important thing is to give a good agent good fruit to handle. Once the market receives bad fruit the demand ceases, prices drop, and agents then have difficulty in getting payable returns for the grower. Buyers will pick out the best packed and graded fruit, causing the grower of badly graded and packed lines to lose on his consignment. The advantages of good packing and grading are very pronounced on a slow market.

Grading.

With tomatoes, grading usually is the worst carried out operation, growers as a rule mixing all sizes and colours. We know that at the start of a season, owing to the small quantities of fruit ready to harvest, it is hard to separate all grades into separate cases, but this is an easy matter when the season is in full swing. Retail buyers and agents want fruit packed true to size and colour; fruit of a uniform size being either all green matured fruit fit for country orders or ripe fruit suitable for city and suburban trade. Growers in remote districts may possibly find difficulties in landing their tomatoes in perfect condition as regards colour on distant markets, but big improvements can be made by these growers. One sees in the markets fruit from distant districts almost totally green throughout the case, but having ,perhaps, a dozen to twenty ripe or nearly ripe fruits in the case. A case of this description of pack is of no use to any buyer. If bought for country trade, the ripe fruit would be found running out of the box on arrival at its destination, and not being ripe throughout the case it is of no use for a city or suburban buyer. Some growers reverse this practice by having ripe tomatoes with a few green specimens included. Another bad fault is the packing of immature tomatoes. Many growers in trying to catch early markets pick before the fruit is mature, so giving it no chance to even ripen properly. The public, through buying immature fruit at the start of the season when prices are high, is turned against tomatoes with the consequent causing of the marketing troubles mentioned previously. Any immature fruit that may be picked by accident should be rejected when packing. Diseased, blemished, and cracked fruit should not be included; one or two specimens of this description lowers the value of the whole case.

Sizing.

For the successful packing of tomatoes sizing is absolutely necessary, and must be done before proceeding to pack. It is possible with citrus, apples, or pears to pack without sizing first, but with tomatoes it is essential to size first. At present we do not know of any sizer that is a complete success for sizing tomatoes, but the revolving roller and moving belt type of appliance is a big help. The best method for the grower with a small acreage is a sizing table, a diagram of which is shown (Fig. 1). This can easily be made at home. It is necessary to have the centre raised to allow the fruit to run to the edges of the table where the packers are working. This saves reaching for fruit. Packing operations are conducted from the sides of the bins or compartments of the table. To save throwing or rough handling on the part of the operator sizing the fruit, it is advisable not to make the table too big. Benches 3 feet by 3 feet are a good size; this would mean a table 9 feet long by 6 feet wide. There are five compartments for sizing, the space in the middle at one side being used by the sizer to stand in whilst sizing. A bench for standing the packing bucket on is a great convenience and time saver—allowing the sizer to use both hands for operations. Best results will be obtained where it is possible always to have the sizing done by the same person, who will soon become very fast and expert.

A packing stand to hold two cases can also be easily made (Fig. 2). Packers are advised to pick two sizes together from each bin.

Packing.

Many and varied are the ways one sees the operation of packing carried out. Flat packs, solid packs, and square packs all have their supporters, but the standard check pack with its pocket system has all the advantages; easy to learn and easy to do when following on the sizing operation, and all sizes will pack correctly. The most popular box for marketing tomatoes is the dump half bushel 18 inches by $8\frac{5}{8}$ inches by $7\frac{1}{8}$ inches, but some growers use the half long-bushel case with a partition 26 inches

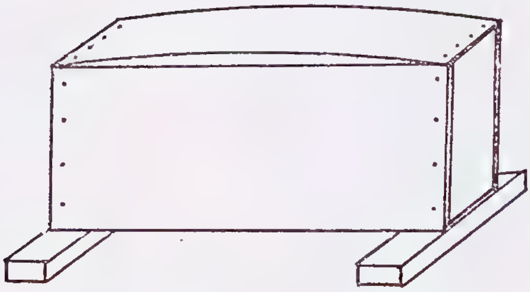


PLATE 93 (Fig. 4).—NAILING DOWN.

Method of placing two pieces of timber on the floor of shed. This makes a good solid nailing down bench, and permits the bottom of the case as well as the top to bulge slightly when the lid is nailed on.

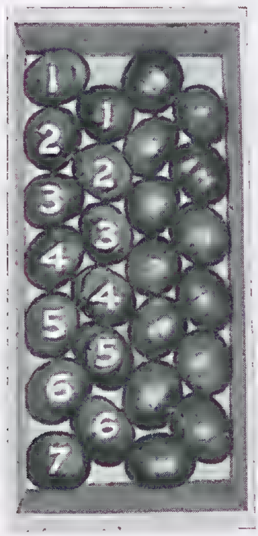


PLATE 94 (Fig. 5).

The method of obtaining the layer count is by counting two alternate lines of fruit from end to end of the case.

by 6 inches by $7\frac{1}{8}$ inches. The advantages of the dump half bushel are as follows:—Easier and quicker to make up through having no partition, a better shape for handling, stacking, and carting, and, being wider, easier to pack into—allowing a packer more room to work with greater speed. Its shape also lends itself to displaying fruit to better advantage. Some packers make the dump half bushel case the narrow way 18 inches long by $7\frac{1}{8}$ inches wide by $8\frac{5}{8}$ inches deep (Figs. 11 and 12), but making it the broad way 18 inches long by $8\frac{5}{8}$ inches wide by $7\frac{1}{8}$ inches deep is to be preferred—allowing more room to work in, and giving fewer packs and counts (see packing tables), with greater ease in sizing. It also has fewer sizes that give trouble to the beginner in getting fruit up to the correct height in the case. The best plan is, where possible, to pack the tomatoes over-night, nailing them down and despatching the next day.

By studying the illustration (Fig. 3) of the four specimens of tomatoes shown on their cheek and on the flat there will be seen one of the great reasons why we use the cheek pack in preference to the flat pack. By placing fruit of a given diameter, which is the system of sizing used commercially, we get an even, level layer, but by placing fruit on the flat we get uneven layers to pack on, which greatly increases our difficulties in bringing the case up to an even face for lidding or for display purposes. It would also be impossible to have standard packs and counts if using any system but the standard diagonal cheek pack. Once a type of tomato of a given diameter is packed correctly the same type and size will always pack correctly and give the same count by using the same pack.

PACKS THAT WILL BRING TOMATOES TO THE CORRECT HEIGHT IN THE DUMP HALF-BUSHEL CASE.

In cases made on the wide system (Fig. 8), 18 in. long, $8\frac{5}{8}$ in. wide, $7\frac{1}{8}$ in. deep.					In cases made on the narrow system (Figs. 11 and 12), 18 in. long, $7\frac{1}{8}$ in. wide, $8\frac{5}{8}$ in. deep.				
Size.	Pack.	Layer Count.	Number of Layers.	Total.	Size.	Pack.	Layer Count.	Number of Layers.	Total.
	3–2	9–9	4	180		3–2	8–7	6	225
	3–2	9–8	4	170		3–2	7–7	6	210*
$2\frac{1}{4}$	3–2	8–8	4	160		3–2	7–6	6	195*
	3–2	8–7	4	150		2–2	9–9	5	180
$2\frac{1}{2}$	3–2	7–7	4	140		2–2	9–8	5	170
	3–2	7–6	4	130	$2\frac{1}{4}$	2–2	8–8	5	160
	2–2	7–7	4	112*		2–2	8–7	5	150
	2–2	7–6	4	104*	$2\frac{1}{2}$	2–2	7–7	5	140
$2\frac{3}{4}$	2–2	6–6	4	96*		2–2	7–6	5	130*
$2\frac{3}{4}$	2–2	8–8	3	96		2–2	6–6	5	120*
	2–2	8–7	3	90		2–2	6–5	5	110*
	2–2	7–7	3	84	$2\frac{3}{4}$	2–1	9–8	4	102
3	2–2	7–6	3	78		2–1	8–8	4	96
	2–2	6–6	3	72		2–1	8–7	4	90
	2–1	8–7	3	68		2–1	7–7	4	84
$3\frac{1}{4}$	2–1	7–7	3	63*	3	2–1	7–6	4	78
						2–1	6–6	4	72
					$3\frac{1}{4}$	2–1	6–5	4	66*
						2–1	5–5	4	60*
						2–1	6–5	3	50

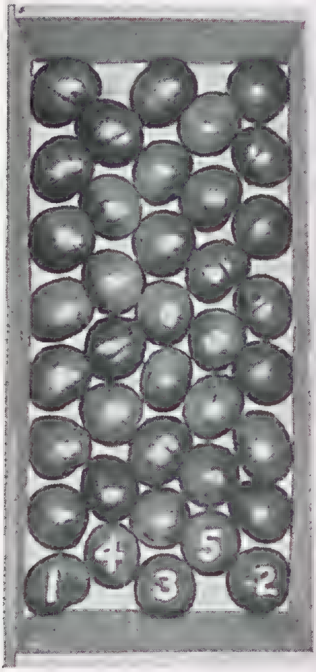
* Denotes open packs.

Nailing down is best carried out by placing two battens lengthways on the floor so that the ends of the case will rest on them, allowing the bottom to bulge slightly when the lid is nailed on (Fig. 4).

The chief points of the standard pack are as follows. Memorising these will assist the beginner a great deal:—

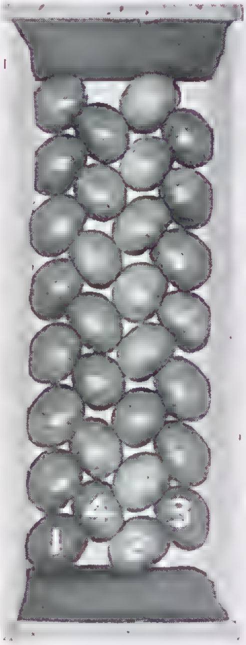
1. All fruit to be placed on edge, that is, on its cheek;
2. Use three packs: 3—2, 2—2, and 2—1 (Fig. 6).
3. Two fruits must not rest directly one on top of the other but in the pockets formed by the spaces between the fruit of the previous layer (Fig. 7).

3—2 pack, 8 x 7 layer, 4 layers in the case, total 150. The layer count is obtained by counting from end to end two side by side lines of fruit in the case. (*See* Fig. 5)



First layer 3—2 pack. The pack gets its name from the first layer being started with three placed against the end of the case and then two being placed in the pockets formed by the three. his is repeated until the layer is full.

2—2 pack, 7 x 6 layer, 3 layers in the case, total 78. The layer count is obtained by counting from end to end two side by side lines of fruit in the layer. (*See* Fig. 5.)



First layer 2—2 pack. The pack gets its name from the first layer being started with two placed against the end of the case and then two being placed in the pockets formed by the two. This is repeated until the layer is full.

2—1 pack, 8 x 7 layer, 3 layers in the case, total 68. The layer count is obtained by counting from end to end the side by side lines of fruit in the layer. (*See* Fig. 5.)

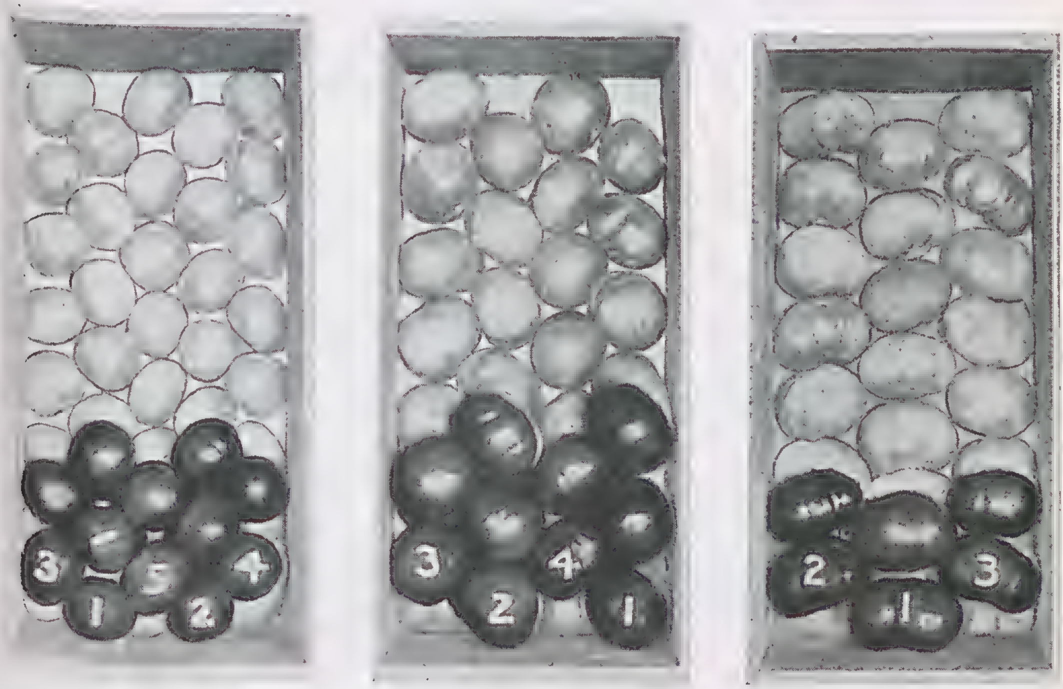
First layer 2—1 pack. The pack gets its name from the first layer being started with two placed against the end of the case and then one being placed in the pocket so formed This is repeated until the layer is full.

PLATE 95 (Fig. 6).—FIRST LAYERS OF THE 3—2, 2—2, AND 2—1 PACKS. Note the order and position of placing each fruit.

4. The height of the fruit in the case is governed by the size of the pockets in each layer (Figs. 9 and 10).

5. Correctly packed fruit is always placed in straight lines from end to end, across and diagonally in the case (Fig. 8), the fruit always being in alignment.

The illustrations show the method of carrying out the rules of packing, and also show the method of placing the fruit and arriving at the name of pack and layer count mentioned in the table of packing counts (see Fig. 5). Reference to the packing count table will give the beginner an idea of the pack to use for each size. Packing counts are given for the dump half case made both ways and for



Second layer 3—2 pack. This layer starts with two tomatoes resting in the pockets of the first layer, which started with three tomatoes.

Second layer 2—2 pack. This layer starts with two tomatoes resting in the pockets of the first layer, which started with two tomatoes.

Second layer 2—1 pack. This layer starts with one tomato resting in the pocket of the first layer, which started with two tomatoes.

PLATE 96 (Fig. 7).—METHOD OF PLACING FRUIT IN PACK.

Note how the tomatoes rest in the pockets of the previous layer.

the long half-bushel case. A handy sizing gauge can be made by cutting holes 2 inches, $2\frac{1}{4}$ inches, $2\frac{1}{2}$ inches, $2\frac{3}{4}$ inches, 3 inches, and $3\frac{1}{4}$ inches in diameter in a piece of plywood. A $2\frac{1}{4}$-inch fruit is one that will drop through a $2\frac{1}{2}$-inch ring but not through a $2\frac{1}{4}$-inch ring; $2\frac{1}{2}$-inch is fruit that will not go through a $2\frac{1}{2}$-inch ring but will drop through a $2\frac{3}{4}$-inch ring. The same method of measuring applies to the other sizes. It is necessary to make a good start in packing the case correctly, and great care should be taken to see that a good snug, firm, first layer with all fruit in alignment is packed. By placing the correct sized fruit in the pockets of the first and each successive layer the packer will soon learn to pack correctly. By studying the illustrations of the start of the second layer packers will see how the second layer fits in the pockets of the first layer. The third layer is the same as the first, being placed in the pockets of the second layer. It is advisable not to try to pack too fast when first learning. Pace is acquired with practice.

That the height of the fruit is governed by the size of the pockets in each layer, is the most important rule in packing to remember. The counts marked with an asterisk (*) are the counts that are likely to give trouble. As an example, we will take the $2\frac{1}{2}$-inch tomato, 2—2 pack, 7—6 count, with 104 tomatoes. Most packers would try to pack this 2—2 with closed pockets 8—8 count with three layers containing 96 tomatoes, which would come low (Fig. 9), but by opening the pockets and getting a 2—2 pack, 7—6 count, and four layers containing 104 tomatoes (Fig. 10) the case is brought to the correct height without any trouble. The difference in the two cases is: Incorrect count 3 layers of 32, total 96; correct count, 4 layers each containing 26, or 8 more tomatoes to the case. This pocket system can be worked with all types of fruit, and the packer who masters it is soon expert in packing. Study the packing counts and see the packs that have to be packed with the open pockets, these being the only counts that may present difficulties to the beginner.

Noticing the correct alignment of fruit when packing is a guide to the packer, faults being easily detected by observing the pack getting out of alignment. When this occurs the packer should correct the fault immediately by removing the incorrectly sized fruit.

Mistakes must be corrected as they occur, because it is impossible to finish a case perfectly if any one layer is wrong. Packing a layer with fruit too small and placing in two extra is the most common fault found with beginners. When finishing off a case packed with open pockets many packers place two extra small tomatoes in the pockets at the end of the top layer, making it hard to get the lid on and spoiling the alignment of the whole case. A case only holds a certain quantity, and placing more in the case only causes bruising or splitting.

It will always be wise to remember the following points in marketing:—

Good packing alone will not keep up a demand for bad fruit. Good fruit is always necessary, and good fruit well packed and attractively got up is easy to sell and will, in times of over-supply, be the first to be disposed of.

Some growers wrap their tomatoes, but the use of lining paper only is really all that is necessary. It improves the appearance of the finished case to use plain or coloured paper for lining in preference to the use of newspaper, which looks shoddy and shabby, favoured by some of the growers. A coloured label also adds distinction to the packed case, and is recommended. Good packing and get-up followed by careful handling and loading whilst in transit to the market will give the grower the best returns for his labour. Using a packed case as a seat while carting is a very common fault with growers and carters, as is also the walking on cases while stacking in trucks. Want of thought is the reason as a rule why fruit is badly handled in these ways.

Acknowledgment.

Thanks are due to Mr. P. Bach, Pinklands, Mr. A. F. Smith, and Mr. W. Burns, Thornlands, and Arkell and Sons, Fruit Exchange, Brisbane, for making available fruit for illustrations.

Main Points to Remember.

In conclusion, the following are the main points for packers and others who handle fruit to remember:—

Don't place green and ripe fruit in the one case.

Don't place one fruit directly on top of another when packing, but keep them in the pockets of the preceding layer.

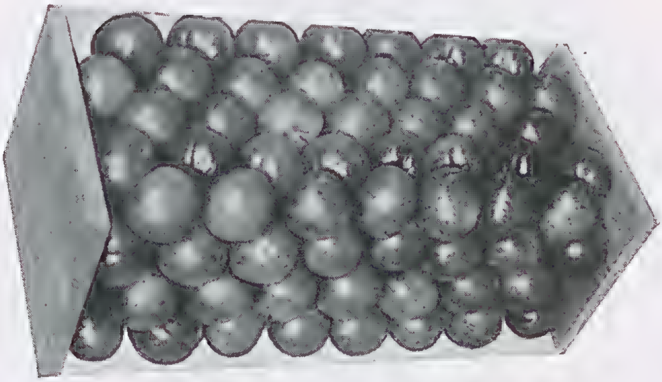
Don't stand, walk, or sit upon packed cases.

Don't pack immature green tomatoes; they will not ripen properly.

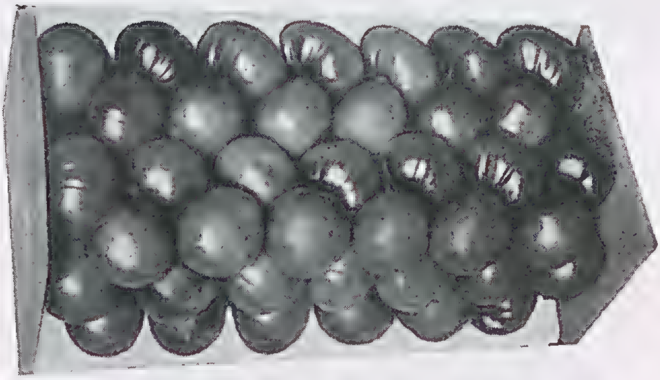
Don't pack defaced, marked, or damaged tomatoes; they reduce the value of the case.

Don't use newspaper for lining; plain paper pays.

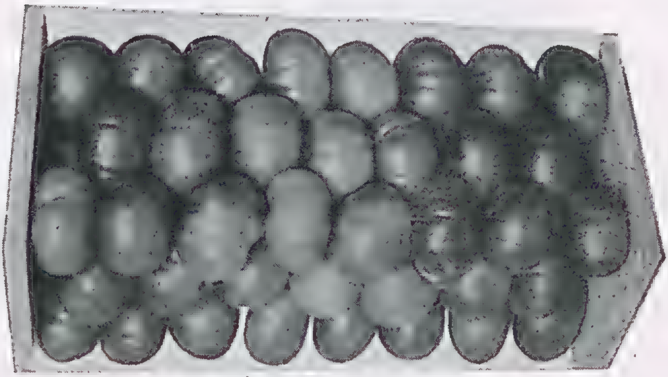
Don't try and pack large and small tomatoes in the one case; it spoils the alignment and the appearance of the pack and helps to reduce the price of the case.



Finished case, 3—2 pack.

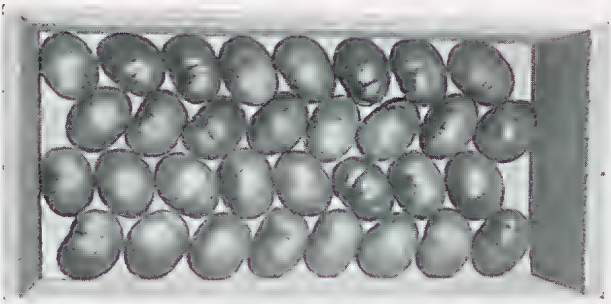


Finished case, 2—2 pack.

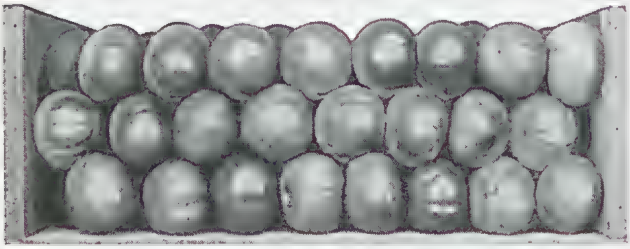


Finished case, 2—1 pack.

Plate 97 (Fig. 8).—Alignment of Fruit in the Case.



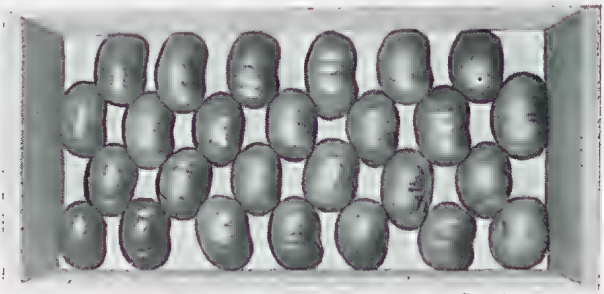
First layer.



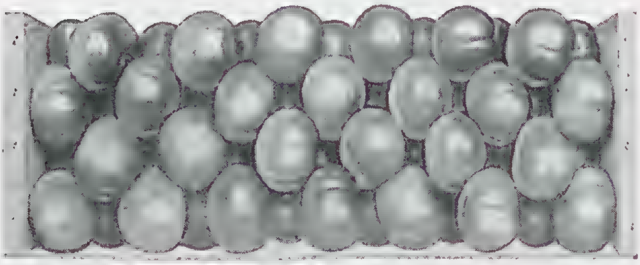
Finished case not high enough.

PLATE 98 (Fig. 9).

2½-inch tomatoes packed 2—2 with closed pockets, 8 x 8 count, 3 layers, 96 tomatoes, which is too low, but when packed with open pockets, as in Fig. 10, comes to the correct height.



First layer.

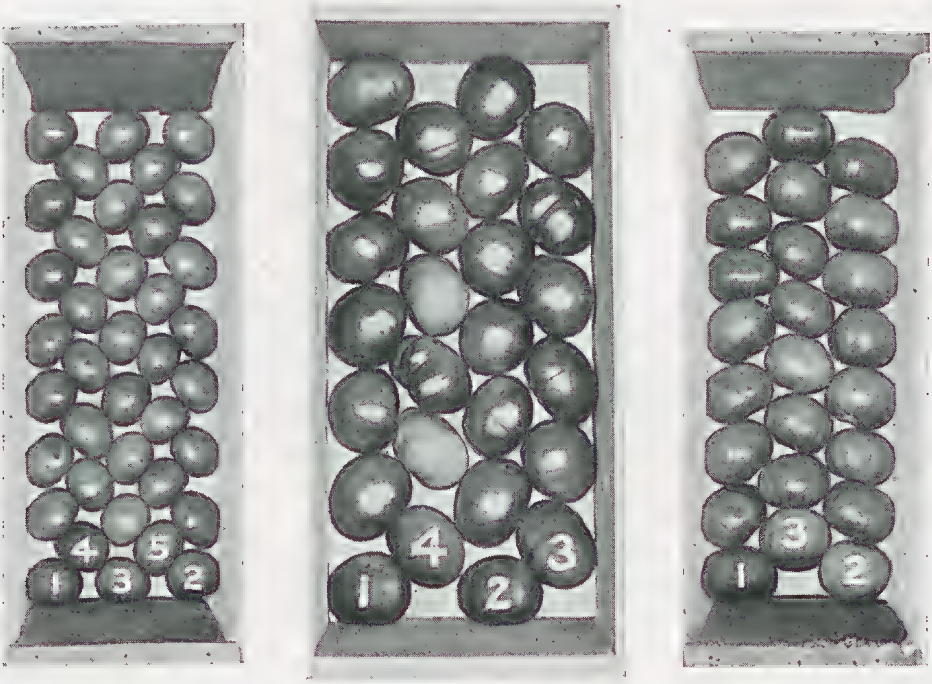


Finished case.

PLATE 99 (Fig. 10)—THE SAME FRUIT AS IN FIG. 9.

Packed 2—2, with open pockets, 7 x 6 count, 4 layers, 104 tomatoes, which comes to the correct height.

These illustrations explain the rule—"The size of the pocket governs the height of the fruit in the case."



3—2 pack. 8 x 7 count, 6 layers, total 225.

2—2 pack. 6 x 7 count, 5 layers, total 150.

2—1 pack. 8 x 8 count, 4 layers, total 96.

Plate 100 (Fig. 11).—First Layers Packed in Cases made on the Narrow System.

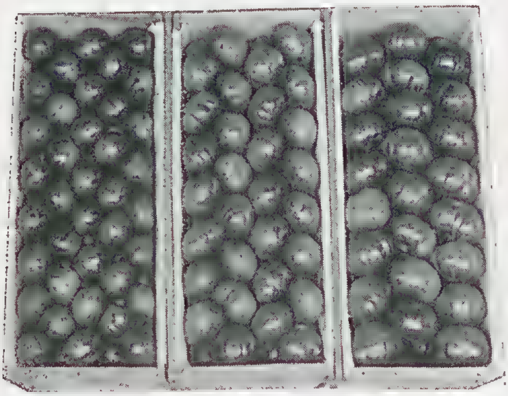


Plate 101 (Fig. 12).—Finished Packs in Cases made on the Narrow System—18 in. long, $7\frac{1}{8}$ in. wide, $8\frac{2}{3}$ in. deep.

POULTRY FEEDING TEST.

THE rapid development of the poultry industry and the resulting increased demand for the more popular poultry foods suggested the need of a feeding test to decide their relative values. Accordingly, a test was commenced on the 1st May, 1929, at Mount Gravatt, by officers of the Department of Agriculture and Stock, with the object of making a comparison with wheat and wheat by-products on the one hand and maize and maizemeal on the other; and, as barley can be secured at reasonable prices at times, it was considered desirable to utilise this grain in a test also. It was hoped to serve a double purpose in so far as that individual records of production might be obtained per bird as well as the determination of the suitability of various foods for egg production.

The test commenced with 288 birds belonging to different poultry breeders. Each breeder supplied twenty-four birds of the same age, breed, and, as far as possible, of the same strain. These birds were divided into groups of eight and placed in a large shed for intensive attention with a similar number of birds of other breeders. By working along these lines it was thought that the average breeding of the birds in each pen would be uniform, and in order that the breeders who supplied birds would gain some advantage, the birds were all trap-nested and their owners supplied fortnightly with the progressive results of egg production.

Feeding.

The system of feeding was to place a mixture in the form of dry mash in hoppers. The grain was also fed in hoppers. Under these conditions the birds were at liberty to consume as much as they desired of either mash or grain. In "A" pen the mash was composed of 37 per cent. of maizemeal, 20 per cent. of bran, 15 per cent. of lucerne meal, 10 per cent. of pea meal, 10 per cent. of meat meal, 5 per cent. of cotton seed meal, 2 per cent. of bone meal, and 1 per cent. of salt; while the grain supplied was whole yellow maize. In pen "B" the mash consisted of 52 per cent. pollard, 26 per cent. bran, 12 per cent. lucerne meal, 7 per cent. meat meal, 2 per cent. of bone meal, and 1 per cent. of salt, while the grain supplied was wheat. In the other pen neither bran nor pollard was used in compounding the mash, a feature of considerable importance to poultry raisers in Queensland. The mash, in this case, consisted of 52 per cent. of maize meal, 15 per cent. of lucerne meal, 10 per cent. of pea meal, 10 per cent. of meat meal, 10 per cent. of cotton seed meal, 2 per cent. of bone meal, and 1 per cent. of salt. With the grain supply another departure from the usual practice was adopted in the feeding of barley. In addition, a quantity of lawn clippings was supplied to each pen regularly.

AVERAGE FOOD CONSUMPTION.

——	Pen A.		Pen B.		Pen C.	
	Lb.	oz.	Lb.	oz.	Lb.	oz.
Grain per bird	38	1	57	4	43	6
Mash per bird	31	3	18	5	27	5
Total	69	4	75	9	70	11
	oz.		oz.		oz.	
Food consumed daily per bird ..	3·4		3·7		3·4	

Laying.

The laying of the birds was not of an exceptionally high standard. This, however, must not be attributed to inferior stock or to an inferior method of feeding; for the ration supplied to pen "B" conformed very closely to that used in many egg-laying competitions. The poor laying was undoubtedly due to (1) changed housing conditions; (2) sudden change in diet; and (3) change of environment at a critical period. The last reason caused many birds to break into a slight moult and, in many cases, a full moult.

The following table gives the final results for each breeder, as well as the total production in each pen:—

From 1st May, 1929, to 30th March, 1930.

Owner.	Total Eggs Laid. 1st Grade.	Total Eggs Laid. 2nd Grade.	Total Value. £	s.	d.
White Leghorns.					
A. A. Cousner	1,900	1,135	16	18	0
Queensland Hatcheries	1,185	1,590	16	4	4
Geo. Currie	1,867	1,042	16	2	8
W. E. Woodward	1,819	1,172	16	2	1
Ray Harrison	1,529	1,220	15	3	11
Geo. Cox	1,507	1,086	13	16	7
H. M. Campbell	1,274	1,256	12	16	9
H. L. Marshall	1,460	813	12	11	8
Geo. Pitt	887	1,413	12	8	9
Woodlands Poultry Farm	1,494	953	12	6	9
Australorps.					
J. D. Hiddle	1,604	1,064	14	12	7
P. U. Gooch	1,530	957	14	8	8

Total Production.

Pen A.—11,750. Pen B.—12,229. Pen C.—11,380.

Eggs Laid in each Pen from 1st May, 1929, to 22nd March, 1930.

Eggs Laid.	Pen A.	Per centage.	Pen B.	Per centa e.	Pen C.	Per centage.
First Grade	6,371	55·8	5,239	44·0	6,285	57·0
Second Grade	4,180	36·6	5,354	45·5	4,012	36·4
Eggs under weight	870	7·6	1,305	10·5	719	6·6
Totals	11,421	..	11,898	..	11,016	..
Eggs laid out traps	211	1·8	245	2·0	262	2·3
Average number of eggs laid per bird	Pen A. 137·2		Pen B. 145·7		Pen C. 129·0	

Two features brought out in this test were—

(1) The wheat ration gave better production; and

(2) In both cases where maize was extensively used the proportion of first grade eggs was greater than that from the wheat ration; there were also considerably fewer undersized eggs produced, as will be seen in the above table.

No definite conclusion can be drawn from one test of this nature, but there appears to be no reason why maize should not be more extensively used in feeding for egg production, and, when the price justifies it, used practically to the exclusion of wheat and wheat by-products.

Although fewer small eggs were obtained from the maize-fed pens, the production of individual birds, in some instances, show that a greater proportion of second grade eggs was produced by the maize-fed pens. This is shown in the results obtained by breeders 4, 7, 8, and 12 in the following table:—

EGGS LAID (EXCLUDING UNDERSIZE) FROM 1ST MAY, 1929, TO 22ND MARCH, 1930.

Breeder.	Pen A.		Pen B.		Pen C.	
	1st Grade.	2nd Grade.	1st Grade.	2nd Grade.	1st Grade.	2nd Grade.
1	609	334	445	324	464	228
2	568	285	580	518	652	356
3	333	425	137	687	416	285
4	499	231	670	210	277	329
5	778	244	339	510	731	288
6	540	321	439	592	522	159
7	344	564	313	478	523	520
8	557	347	692	327	639	453
9	671	269	330	463	509	480
10	549	233	418	424	517	295
11	249	450	532	557	475	241
12	674	477	344	264	560	318

Values.

The table showing the quantity of food consumed for each dozen eggs and the profit over cost does not indicate any very marked advantage in the feeding of maize. However, during the greater portion of the testing period maize was costly, but when the quantity required to produce a dozen eggs is taken into consideration, it will be noticed that there is a slight advantage. With the maize ration, accordingly, when maize is cheaper than wheat it would be a sound policy for it to be extensively used, providing the change in diet is made a gradual process.

TABLE SHOWING FOOD CONSUMED PER DOZEN EGGS, AND COSTS, NET MARKET RETURNS AND PROFIT PER DOZEN EGGS OVER FEEDING COSTS.

Period Ending.	Food Consumed per Dozen Eggs.			Cost of Feed per Dozen Eggs.			Nett Egg Prices per Dozen.	Profit per Dozen Eggs over Feeding Costs.		
	Pen A.	Pen B.	Pen C.	Pen A.	Pen B.	Pen C.		Pen A.	Pen B.	Pen C.
	Lb.	Lb.	Lb.	*d.*	*d.*	*d.*	*d.*	*d.*	*d.*	*d.*
1929.										
6 June ..	6·9	8·3	8·2	8·6	9·5	11·6	22·7	14·1	13·2	11·1
29 June ..	6·9	8·6	7·7	8·7	9·7	10·8	16·9	8·2	7·2	6·1
27 July ..	7·2	7·2	8·1	8·2	8·2	11·4	14·4	6·2	6·2	3·0
24 August ..	4·3	6·0	5·2	5·6	6·8	6·7	11·4	5·8	4·6	4·7
21 September	4·6	4·3	4·2	6·0	5·4	5·9	10·5	4·5	5·1	4·6
19 October ..	5·6	5·1	5·2	6·9	5·9	6·7	10·6	3·7	4·7	3·9
16 November	4·4	5·7	6·6	5·4	6·5	8·8	10·6	5·2	4·1	1·8
14 December	6·2	5·2	5·6	7·7	6·0	7·5	11·9	4·2	5·9	4·4
1930.										
11 January..	5·2	5·7	5·8	6·4	6·5	7·7	11·0	4·6	4·5	3·3
8 February	9·8	6·1	7·6	12·2	7·0	10·2	12·7	0·5	5·7	2·5
8 March ..	11·9	8·1	12·1	14·7	9·3	16·1	13·8	*0·9	4·5	*2·3
22 March ..	12·4	12·1	11·2	15·4	13·9	15·0	15·4	..	1·5	0·4
Average ..	6·1	6·2	6·5	7·5	7·1	8·7	13·6	6·1	6·5	4·9

NOTE.—The asterisk denotes that a loss resulted in A and C pens.

Effect on Bodily Weight.

All birds were weighed on entering the test, and those in lay were weighed once every four weeks when removed from the trap nests, and a final weighing was made when the birds were crated and returned to their owners.

The following is the average weight of each lot on entering the test, and again at the termination:—

Lot.		Pen A.		Pen B.		Pen C.	
		Lb.	oz.	Lb.	oz.	Lb.	oz.
1	Commencement	5	3	5	3	5	1
	Termination	4	14	5	2	4	14
2	Commencement	4	1	4	2	4	6
	Termination	3	15	4	2	4	1
3	Commencement	3	2	3	3	3	3
	Termination	3	6	3	4	3	5
4	Commencement	4	3	4	5	4	1
	Termination	3	12	3	13	3	10
5	Commencement	3	9	3	9	3	11
	Termination	3	8	3	8	3	7
6	Commencement	4	8	4	4	3	12
	Termination	3	8	4	1	3	2
7	Commencement	3	9	3	11	3	10
	Termination	3	15	3	11	3	5
8	Commencement	4	3	4	1	3	11
	Termination	3	12	4	0	3	11
9	Commencement	4	3	4	3	4	3
	Termination	3	7	3	8	3	12
10	Commencement	4	2	4	0	3	11
	Termination	3	14	3	13	3	7
11	Commencement	3	11	3	10	3	11
	Termination	3	11	4	0	4	0
12	Commencement	4	14	5	3	5	3
	Termination	4	13	5	1	4	10

Extensive maize feeding is credited with causing the birds to become unduly fat. There is absolutely no evidence of that being the case in this test.

Mortality.

During the currency of the test the mortality of stock was exceptionally heavy, being as follows:—

CAUSE.

Pen A. 14 Deaths.		Pen B. 26 Deaths.		Pen C. 16 Deaths.	
Protrusion	4	Roup	7	Roup	6
Intestinal Tumor ..	3	Hemorrhage of Liver	3	Wasting	3
Heat	2	Wasting	5	Tumour	4
Kidney Disorder ..	2	Kidney Disorder ..	2	Kidney Disorder ..	1
Wasting	1	Heat	2	Hemorrhage of Liver	1
Hemorrhage of Liver ..	1	Not Diagnosed ..	4	Protrusion ..	1
Roup	1	Tumour	2		
		Protrusion ..	1		

COCCIDIOSIS IN CHICKENS.

Notes on this subject by Mr. P. Rumball, Poultry Expert, were published in the Journal for November, 1927, and, in response to numerous requests from our readers, they are now reprinted after revision (in the absence of Mr. Rumball, who is attending the World's Poultry Congress in England) by Mr. J. J. McLachlan, Poultry Inspector.

THIS is probably the most destructive disease affecting chickens in Queensland. The disease, however, is not confined to chickens only, as well developed pullets frequently lose the use of their legs as a result of infection, while adult birds are often affected in a chronic form. Death from chronic infection may take place in a few days, or the bird may linger several weeks. With chickens between the ages of two and eight weeks the disease assumes serious proportions, particularly so under favourable conditions.

Cause.

Coccidiosis is caused by microscopic parasites termed *Eimeria Avium*, which when taken into the digestive tract by susceptible chickens rapidly develop and multiply in the walls of the intestines, particularly the cæca or blind gut.

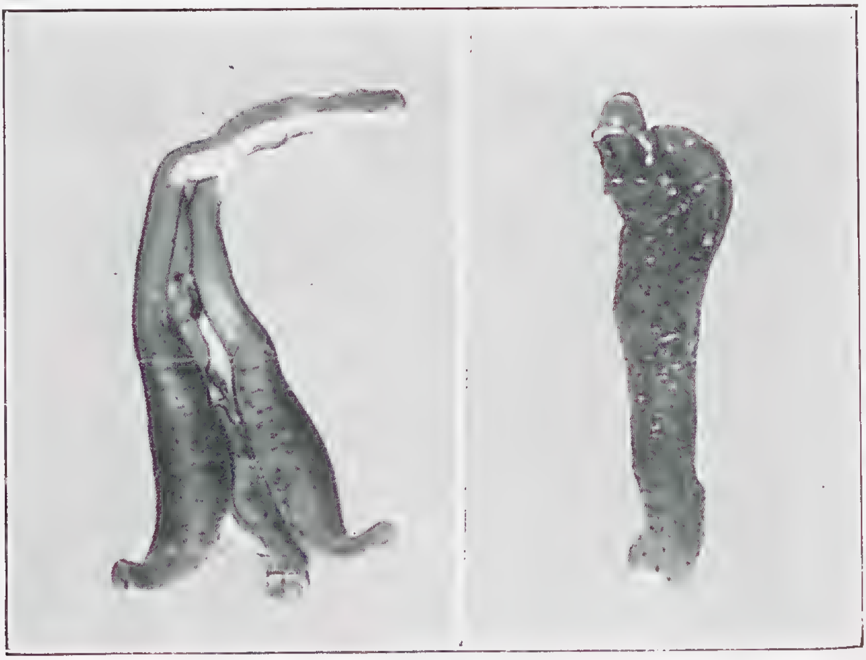


PLATE 102 (Fig. 1).

Showing cæca and portion of opened cæca from two 4-week old infected chicks. Note the red blotches where these parasites have damaged the inner walls of this organ. This condition is not always so pronounced.

Life Cycle.

In the completion of its life cycle the parasite passes through many stages of development. A knowledge of certain of these forms is of practical importance in the application of efficient methods of prevention and ontrol.

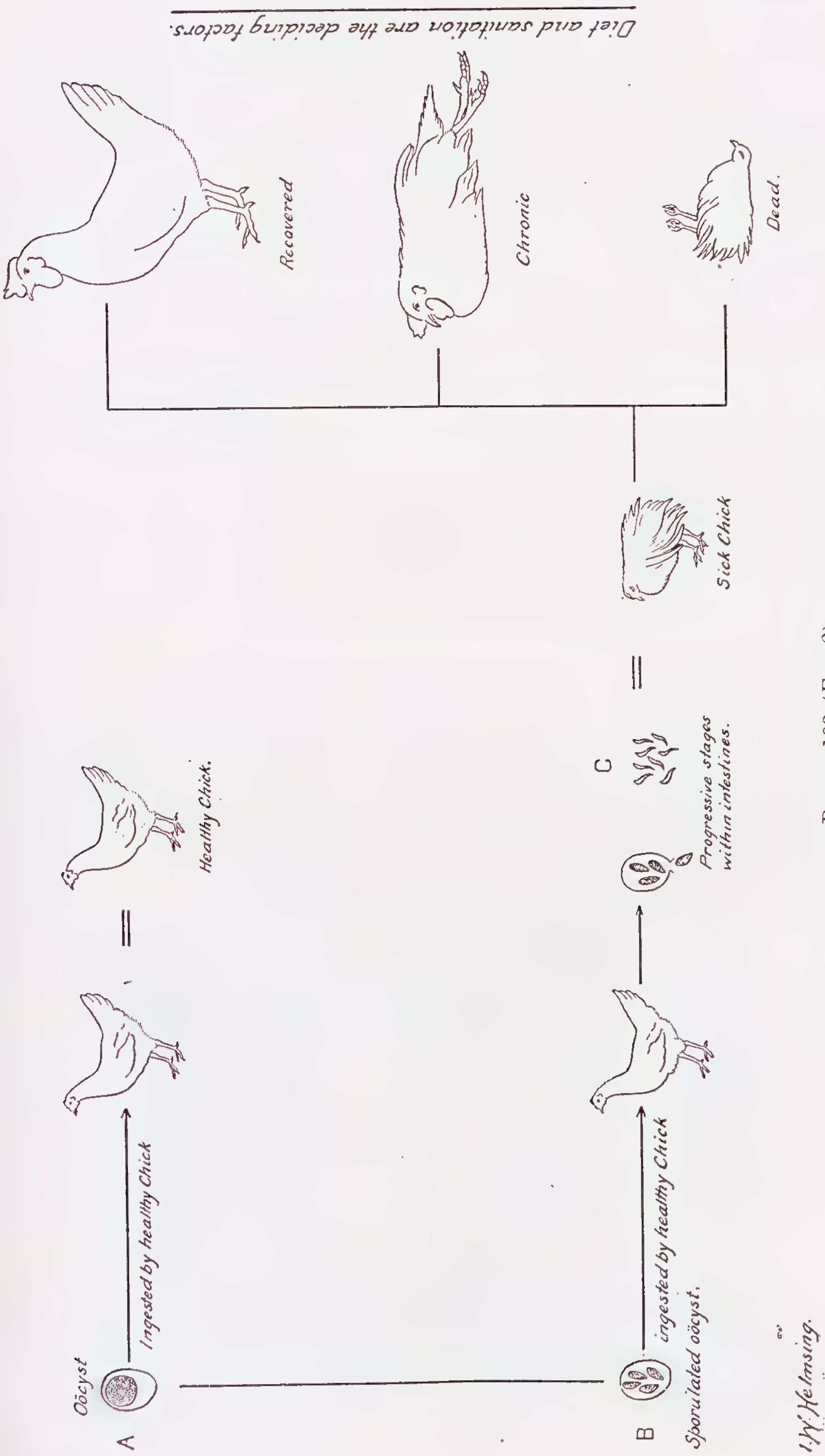


Plate 103 (Fig. 2).
Showing life cycle of *Eimeria Avium*, the cause of Coccidiosis.

The first, or egg stage, is known as the oöcyst, the organism being encompassed by a covering which is comparable to the outer membrane of a hen egg, and by a fluid like the white of an egg; this organism is similar in shape to the yolk of an egg (see Fig. 2A). These oöcysts are voided with the droppings of diseased birds. In this stage the organism will not cause coccidiosis if taken back into the digestive system. The conditions under which chicks are generally reared, however, lend themselves to sporulation or the second stage of development (see Fig. 2B). In making this change a period of two to three days is required, depending on the suitability of conditions. Moisture and temperature are the governing factors. When changing, the part which compares with the yolk divides into four bodies. In this stage the parasite is capable of producing the disease in approximately forty-eight hours, and when the sporulated oöcysts are taken into the digestive tract of chickens another change takes place. The four bodies are released, and again divide. These are termed "sporozoites" (Fig. 2C). The parasite then begins to live on the mucus lining of the intestine and cæca, undergoing several changes until eventually the oöcyst or egg stage is produced and is voided with the droppings.

Knowing a little of the life cycle of this parasite, which takes five to six days to complete under favourable conditions, it can be readily understood how rapidly it will multiply, also the easy manner in which it is transmitted from chick to chick, by sporulated oöcysts adhering to particles of food or even per medium of the drinking water. It can be carried from pen to pen by adhering to the attendant's boots; flood waters, flies, wild birds, brooder equipment, and many other ways are also responsible for transmission of this disease from pen to pen and farm to farm. It is claimed by some authorities that the sporulated oöcyst will remain alive in the soil for over a year. Breeders, therefore, who have experienced this disease should take precautionary measures to prevent its recurrence by disinfection and the spelling of pens.

Symptoms.

The first indication of the disease is the tendency of the chicks to bunch together, with closed eyes and drooping wings. On being disturbed they move about, apparently quite normal, with the exception that their backs appear to have somewhat shortened. The tips of their wings, vents, and rear portions of their bodies are frequently stained with excreta. If an examination is made of the excreta of the chickens it may be found to be brick-red in colour, due to the presence of blood in the droppings. The parasites living on the mucous lining of the intestines cause the destruction of small blood vessels resulting in hemorrhage. However, blood is not always present in the droppings. During the day or the following morning some of the chicks will die, and the number of shortened-backs and droopy-winged chickens will have increased.

PLATE 104 (Fig. 3).—CHICK WITH COCCIDIOSIS IN SEVERE FORM.
Note the tips of the wings are stained with blood.

On opening up one of the dead chicks the upper portion of the small intestine will be found to be in an inflammatory condition. Blood may be also present among its contents. These conditions are usually more pronounced in the cæca of the chick, which is generally distended and filled with blood. In many cases, the lining of the cæca will have completely disappeared. The other internal organs are generally in a healthy condition. Chicks which survive severe cæcal coccidiosis usually have yellowish or whitish cheese-like "cores" in the cæca in a few days following the development of the symptoms. These cores signify that the disease has run its course. They are not uncommon in chickens in good health. When the core is covered by skin-like material and the interior of it is reddish and crumbly, it is probably due to coccidiosis.

The chronic type of the disease which affects older birds develops slowly and may only affect a few birds in a flock. The outward symptoms are loss of appetite, roughened, dirty plumage, gradual loss of flesh, paleness of the comb and wattles, stilty movements, paralysis of the legs.

The disease in this form is very easily confused with many other poultry ailments, and the symptoms shown are similar to those caused by other poultry parasites. Post mortem examination will reveal that lesions are usually confined to the small intestine. The intestinal walls become somewhat thickened, and the lining has a spongy appearance. In severe cases red blotches may be present. The cæca rarely show any change.

Treatment.

Medicinal treatment has been found to be of little value, therefore preventive methods must be adopted and, in outbreaks, the worst cases destroyed. As the general stamina of the chickens is the best safeguard against any disease, it is essential that the chicks should receive the best care, attention, and feeding. Also, as the parasite in the oöcyst stage is harmless, and sporulation is only possible where the favourable conditions of moisture and warmth prevail, brooder houses should be as free from dampness as possible. The congested conditions under which chickens are reared naturally lead to foul pens and brooders, making them a hot-bed of infection. In conjunction with the fact that two days must elapse for the oöcyst to permit of sporulation, it can be readily understood that by thorough cleaning daily, and frequent disinfection, the disease may be controlled. The practice of scattering grain in the runs, very desirable as a rule, should be discontinued when the disease is present. Grain and all food should be fed in receptacles that can be cleaned once or twice daily. Drinking vessels should be placed off the floor on frames that will prevent the access to moist places by the chicks.

Outbreaks can be controlled by the feeding of buttermilk powder, or fresh skim milk, but without the application of strict sanitary measures in conjunction with the milk diet success in the control of this disease cannot be expected. Where fresh skim milk is available this can be used as the only form of drink. Buttermilk powder may be used solely for twelve to twenty-four hours in cases of severe outbreaks, after which it may form 20 per cent. of the mash, until the disease is checked. This period may last from three to six days. The buttermilk can be then reduced to 10 per cent.

Buttermilk powder not only has curative properties in connection with coccidiosis, but it is a splendid food for both laying and growing stock, particularly so with young chicks. Poultry raisers could make this food form a definite portion of all mashes. With the use of 10 per cent. buttermilk in the mash no other form of protein is required.

The feeding of milk in any form has a tendency to cause the droppings to become very liquid in nature and, consequently, more frequent cleaning is necessary.

THE JOURNAL APPRECIATED.

A Mackay farmer, renewing his subscription, writes (15*th August*, 1930): *"I am very pleased to have such a journal because of the advice and information it contains, and of its general sound policy for the betterment of the farming industry."*

RETIREMENT OF MR. H. W. MOBSBY.

An interesting function took place in the office of the Minister for Agriculture and Stock on 20th August, when a large gathering of officers, representatives of all sections of the Department, attended an official farewell to Mr. H. W. Mobsby, F.R.G.S., F.R.S.A., Artist and Photographer of the Department, on his retirement from the public service.

The Minister (Hon. H. F. Walker), in presenting a wallet of notes to Mr. Mobsby as a token of the esteem in which he was held by his fellow-officers, referred to his long and faithful services, extending over a period of more than thirty-one years, during which term he was attached mainly to the Department of Agriculture and Stock, but for a limited time to the Chief Secretary's Department and the Intelligence and Tourist Bureau.

PLATE 105.—MR. H. W. MOBSBY, F.R.G.S.

The Minister spoke in eulogistic terms of Mr. Mobsby's work in connection with photographic art, which was recognised throughout Australia and overseas, and pointed out that he had been a great asset in placing before the world in photographic and other forms the attractions of his State. He also recalled Mr. Mobsby's services as official representative at the Franco-British Exhibition, the Panama Exposition, the British Empire Exhibition, and the Dunedin Exhibition, and added that he had also effectively represented the State at Exhibitions in metropolitan centres in the other States. Mr. Mobsby had the good fortune to also accompany high dignitaries through Queensland, amongst whom were the Prince of Wales and the Duke of York.

The Minister assured Mr. Mobsby that he left the Department to enjoy an honourable period of retirement with the goodwill and best wishes of every member of it.

Messrs. E. Graham (Under Secretary), H. T. Easterby (Director, Bureau of Sugar Experiment Stations), J. P. Orr (Registrar, Primary Producers' Organisations), and T. C. Troedson (Intelligence and Tourist Bureau) supplemented the Minister's remarks.

Mr. Mobsby, in reply, feelingly expressed his thanks for the good wishes and the tangible token of esteem presented by his fellow officers. and referred to various incidents which had occurred during his visits abroad as Departmental representative at overseas exhibitions. Addressing the younger officers directly, he said that nothing was ever denied to well directed diligence. He counselled them to give of their best to the world and the best would return to them. Good enough was not good enough—Australia must have the best.

A NOTABLE CAREER.

A native of Brighton, England, Mr. Mobsby was educated at Hampton Place High School, in his home city. It was as a lad that Mr. Mobsby got his first taste of exhibition work, when he accompanied his father in his official capacity to the Agricultural Exhibition held on the Goldsmid Estate, Hove, Brighton, England. He studied art and design at the School of Arts, Brighton, and decorative art under Mr. A. G. Greysmith, artist, of London and Brighton. His first personal connection with any exhibition was when he assisted Mr. Greysmith at the Heatheries at the Royal Pavilion Building, Brighton.

After studying chemistry and following a course of general commercial training he left England for Brisbane in 1883, accompanying Mr. W. Jenner, the well-known artist, and his family, Mrs. Mobsby being the eldest daughter of the late Mr. Jenner.

Mr. Mobsby was for some years a member of the teaching staff in decorative art and lettering at the Brisbane Technical College when Mr. D. R. McConnel was director.

Since 1897 he has been attached to the Department of Agriculture and Stock, Brisbane, as Government artist and photographer, and it is during that period that he became so closely connected with this State's interests at the Australian Natives' Association Exhibitions at Melbourne for several successive years, also at Adelaide and Sydney and at the Royal National Show at Brisbane each year. In 1908-9 Mr. Mobsby designed the Queensland Court at the Franco-British Exhibition, and travelled as State representative to London with the late J. M. Campbell to supervise the construction of the lay-out, design trophies, and colour scheme.

While in England he exhibited Queensland products at Newcastle, Lincolnshire, Gloucestershire, also at Aberdeen in Scotland and Dublin, in Ireland. When Sir H. Tozer was Agent-General he transposed Gattis Restuarant, in the Strand, to the present Agency-General, supervising fitting up, furnishing, and laying out the first display of Queensland products in London.

It was while Mr. Mobsby was at the Franco-British Exhibition he was instrumental in raising £166 8s. 2d. in pennies at the Saturday Hospital Fund, which enabled a Queensland cot to be established in the Queen Alexandra Hospital.

The year 1915 saw him again designing and supervising Queensland's Court at the Panama-Pacific Exposition at San Francisco, United States of America, the late J. A. Robertson being Queensland Commissioner, who before the closing retired from the position, and Mr. Mobsby was appointed Acting Commissioner in Charge by the Queensland Government. He was also appointed by the authorities of the Panama-Pacific International Exposition to act on the jury of awards in the wine section, for which he was awarded a medal for special services. While in America Mr. Mobsby gained a diploma and medal for photography, also certificate of efficiency in motion picture work.

After carrying out Australian Natives' Association Exhibitions at Melbourne and the Peace Exhibition at Adelaide, Mr. Mobsby was in 1924 appointed by the Government on the Wembley Commission as State organiser for the Exhibition at Wembley, England. He then went to London by appointment of the Federal Government as display officer at the Wembley Exhibition. At the intervals between exhibitions Mr. Mobsby visited all parts of the State as the official photographer, obtaining pictures of the industries associated with his Department, also scenic pictures which have been used for technical and other publications and lectures all over the world, as well as supplying the Tourist Bureau with pictures in advertising Queensland's productive wealth and scenery, also Departmental record and specimen work in animal and plant pathology by ordinary and micro-photography.

In 1925-26 Mr. Mobsby was appointed by the Government to organise and design the Queensland Court at the New Zealand and South Seas Exhibition at Dunedin, New

Zealand, and afterwards supervised the construction, and was Queensland's representative in charge during the currency of the Exhibition. The display was awarded a gold medal and diploma.

That Mr. Mobsby has not held these positions except on merit is proved by the fact that he holds a number of diplomas, certificates, and fellowships which have been gained in fields which have fitted him for his work, amongst which may be mentioned: Fellow Royal Geographical Society; Senior Diploma Chamber of Commerce, England; Senior Diploma City and Guilds, London; Senior Diploma Cripplegate Institute, London, each for theoretical and practical photography; Medallist World's Photo. Competition; and Fellow of the Royal Society of Artists. He is also honorary lanternist to the Royal Geographical Society of Queensland.

Mr. Mobsby made many friends in his travels overseas and in Australia, where, by his experience and artistic taste, his work has been much appreciated to the benefit of Queensland generally, also in the information obtained and reported to his State and which was afterwards used in extending the State's commercial enterprise overseas. He has been personally instrumental in securing valuable settlers for Queensland, and generally he has given of his best to the service of his adopted State.

On the lecture platform he is also well known, and as a valued public officer he will be very difficult to replace. As a contributor to the "Queensland Agricultural Journal," both by picture and pen, Mr. Mobsby has earned the high appreciation of our readers, everyone of whom will wish him well in the years of his honourable retirement after a lifetime of public service.

PLANT BREEDING AT ROMA STATE FARM.

By R. E. SOUTTER, Manager, Roma State Farm.

WHEAT.

WORK in connection with this crop was taken up in 1907 and has been carried out continuously ever since. During the period which has elapsed innumerable crosses have been made, only a very few of which have produced selections of sufficient merit to warrant their being distributed amongst the farming community, the names of the most favoured of these being Cedric, Duke of York, Flora, Novo, Three Seas, Warchief, and Watchman.

Cedric.

A result of crossing Cedar and Bunge. This selection, which is red grained, hardy, and fairly rust-resistant, yielded 30 bushels to the acre two years in succession in the variety trials. It was distributed among wheatgrowers and has been grown fairly extensively ever since.

Duke of York.

A selection from (Cretan x Bunge) x Gluyas. The cross was made with a view to embodying the rust-resisting, drought-withstanding, and yielding capabilities of the Gluyas with the upstanding habit and rust resistance of the Cretan-Bunge selection. Although susceptible to flag smut, the objects, in a great measure, were achieved, and to-day the variety is favoured by quite a few farmers on the Downs.

In 1928 it was awarded second place in the Toowoomba district competition and third in the Grand Champion.

In 1929 it gained first and second place in the Toowoomba district, came second in the Warwick, and won the Grand Championship, and was also the only crop which secured full points for evenness.

Flora.

A selection from Bobs x Florence, the object being to evolve a selection with the fine milling qualities of Bobs in combination with the resistance to smut and other desirable characteristics of the Florence variety.

Smut resistance was not secured in this selection, but the grain is of pleasing appearance, straw is of medium length, fairly hardy, and rust-escaping, and, although not a heavy yielder, is favoured by a few growers on account of consistency.

Novo.

A Bunge-Indian Pearl cross; a very suitable variety for dry localities; is grown fairly extensively in the Maranoa and parts of the Downs, more particularly Allora, where a yield of 42 bushels to the acre has been obtained. Straw is inclined to be a little weak; escapes rust if sown as a main crop, and produces a grain of good appearance.

Three Seas.

(Cretan x Comeback) x Comeback. The object of this cross was to produce a wheat of good milling quality with a high degree of rust resistance. This latter object was attained, for, during a rust visitation some few years ago it proved to be least infected or affected of all the varieties and selections under observation. It further demonstrated its resistance on the Downs by producing a summer crop of eight bags when varieties like Florence grown alongside were absolutely rendered worthless. Being a bearded variety with a soft grain susceptible to weevil infestation precludes it from being recommended extensively, but some very promising crosses, bald, and early and late in habit, with a good, hard grain, have been under observation for some time, but until their degree of rust resistance has been determined they cannot be distributed.

Warchief.

Soutter's Early x Warren. Same breeding as Watchman, with the field characteristics of Warren—that is, late, good rust resister, hardy, but the grain is of better quality. Was and probably is still grown in some localities in preference to Warren, which variety produced crops heavily infested with loose smut a few years ago. Warchief is suitable for early sowing for hay, grain, or grazing.

Watchman.

This is a selection resulting from crossing Soutter's Early and Warren. The object in making this cross was in an endeavour to combine the earliness and quality of the grain of the former with the rust-resisting, stooling qualities, hardiness, and palatability to stock of the latter. With the exception of some of the more recent crossbreds under observation, this is the earliest variety we have, is extremely hardy, escapes rust. Its hardiness may be gauged from the fact that it is capable of producing a crop of nice, plump grain under conditions fatal to many of the slow-growing varieties.

In 1928, sown in June first, harvested October third week, on a rainfall during the growing period of 234 points, it yielded 25.6 bushels to the acre, whilst in 1929, sown in June and harvested in October, on a rainfall during the growing period of 70 points, it returned nearly 15 bushels to the acre.

The method adopted in connection with the initial operations of crossing varieties are practically the same everywhere, special care being taken to prevent the introduction of foreign pollen when emasculating when pollenising and immediately after.

Although reciprocal crosses are frequently made, it is usual to select as the male parent the individual with the most pronounced dominant characteristics, such as baldness, red chaff, pubescent glumes, &c., so that the intrusion of foreign pollen is more readily discernible in resulting plants. The grains produced are put into containers showing parentage, when cross was made, and harvested, &c.

In the following season these grains are sown in a situation well away from fences and trees and wholly surrounded by early-sown crops so that the chance of injury by birds, &c., is reduced to a minimum.

In all the preliminary work here the grains are sown from 10 to 12 inches apart in the rows, with rows 2 feet apart. This procedure is absolutely essential under our conditions, where the rainfall has to be wholly depended upon to bring the plants to maturity, permitting as it does of inter-row cultivation, thereby enabling full use to be made of the soil moisture by preventing loss through evaporation and foreign growth.

With this system of sowing we have not had a break in the work. By this is meant that the sowings have always provided sufficient seed to carry on, notwithstanding that field crops sown on adjacent plots on similar soil prepared in the same manner have practically failed on more than one occasion.

Last year, on a rainfall of 70 points during the growing period (1st May to 10th October), some of the drills in this section yielded from 14- to 25-bushel rate per acre, whereas in another section, where the drills were 10 inches apart and plants more closely in the rows, on the same class of soil with the same working the yields ranged the rate of 2 to 12 bushels per acre.

When harvesting the grain of the conjugate plants all weak-constitutioned plants are eliminated, and, although not necessary, the grain from the individual plants is saved separately for sowing the next season.

The year following selections are made of those plants of good promise.

In the next season fixed types having desirable field characteristics are selected for further sowing, and further selections made of desirable types met with in unfixed rows.

The following season fixed types selected last year deemed worthy of further trial are tested in chain drills at the farm and by the officers of the Field Branch on the several farmers' plots, so that their behaviour under varying conditions on different types of soil as well as their susceptibility or otherwise to the prevailing kinds of rust may be more readily ascertained.

These sowings are usually made with a seed drill at the rate of a half bushel to acre, drills 2 feet 6 inches apart, with every fifth row sown with the standard variety of the district on soil worked according to instructions received from the Field Branch. Notes as to behaviour and yields recorded at the Farm and by officers, Field Branch.

The next sowing includes all those possessing desirable characteristics. They are sown in the same manner and in the same locations as in the previous season.

The next year the work is practically a repetition of the two previous—elimination of undesirables—but extended areas of any very outstanding selections are sown.

The following year the very few which have proved themselves to be rust-resistant, hardy, with desirable field characteristics, of good milling quality, and better yielders than the standard varieties, are sown in extended areas.

The adoption of the system employed at the Minnesota Station in connection with "Grain Improvement" is being considered. In fact, last season a step in this direction was made, but owing to the very adverse conditions the results were not satisfactory and seem to indicate that the methods adopted in connection with sowing them will have to be altered to meet the conditions here.

BARLEY.

Not very much has been done with this crop. In 1917 a skinless barley was crossed with a two-rowed type, more for the purpose of studying the inheritance of characteristics than anything else.

Resulting from this crop we have half a dozen very promising selections from a green feed or grain-producting standpoint.

Their suitability or otherwise for malting purposes has not been ascertained.

With the exception of the treatment received by the florets when emasculating, the methods employed in evolving a barley variety are similar to those adopted in connection with wheat.

COTTON.

Work in connection with this crop was commenced in 1923, and consisted in testing a number of plants selected on account of their productiveness.

The lint resulting from sowing the seed of these selections was submitted to the Chief Cotton Grader to report upon, with the result that two selections were returned as being worthy of continuing with, one of which is still under observation.

In 1925 selections were made of an Okra-leafed type of cotton found growing in a crop of Durango, for the reason that it was considered possible that this type of foliage might result in the plants being more drought-resistant in a dry climate, less susceptible to disease in a wet, facilitate picking by hand, and afford less impediment to mechanical pickers.

At the present time we have the following under observation:—

3 Okra-leafed selections	⊕	(selfed).
1 Dwarf Durango	⊕	(selfed).
2 Durango sel.	⊕	(selfed).
3 Tall Durango	⊕	(selfed).
1 Variegated Durango	⊕	(selfed).
1 Clean Seed Durango	⊕	(selfed).
1 Okra leaf sel.	⊕	(selfed).
1 Brown seed	⊕	(selfed).
1 Green x Variegated		(selfed).

Progress is slow with this crop owing to the fact that the last two years sufficient rain to sow on has not been experienced until the summer was well advanced, the insect injuries very great, with the result that very little seed has been produced.

Last year a little black beetle appeared whose habits necessitated the covering of any flowers with paper covers where pollen contamination was not desired. Such covering in this climate brings about a sweating resulting in the shedding of many of the flowers.

COWPEAS.

Work with this crop was commenced in 1913, the idea being to evolve, if possible, quick-growing varieties for green manuring purposes, erect growing, kinds suitable for mowing with machinery for conserving in the form of hay or silage, combined with a non-susceptibility to nematode, and improved seed production.

Three selections resulting from this initial work have been grown here on soil heavily infested with nematode for a number of years. Seeds of these have also been distributed outside. More recently attention has been directed to the evolving of nematode-resistant types of several of the best existing varieties as well as the production of fine-growing varieties for conserving in the form of hay and heavy-seeding varieties, which latter kind it is hoped will supply the deficiency in proteins in the pasture in the winter and spring in the same manner as the sheep man is assisted in Western Australia by the lupin in the summer.

It is found that large-seeded varieties produce plants which, during the first two or three weeks of their existence, are much better able to contend with adverse circumstances than those emanating from small seeds. More particularly does this apply to sowings germinating late in the spring on light, sandy soils inclined to blow.

Progress with this crop is rapid, for, with an early germination in the spring, investigations can be carried out with two generations in the one season.

The method adopted in connection with sowing here is as follows:—

Spring sowing.—Three or four seeds are placed in hills 6 feet apart in rows with rows 12 feet apart. Thinned out to individual plants when coming into the 5 feet or 6 feet leaf.

Second sowing (middle January).—Three or four seeds in hills 6 feet apart with rows 6 feet apart.

It has been found that dark-coloured beans are not so susceptible to attack by weevil as the lighter coloured.

Notwithstanding the adverse conditions, we have under observation and looking well sixty-two selections from the following crosses, viz.:—

(Skewbald x Large White) x Californian Black and White.

Large White x Skewbald x Mammoth.

Poonah x New Era x Mammoth.

Home Hill Clay x Poonah Selection.

Home Hill x Mammoth.

Large White x Skewbald x Californian B. and W. x Skewbald.

((Large White x Skew) x C.B. and W.) x Californian B and W.

Snake x Poonah.

Poonah Selection.

Snake x Poonah x Californian B. and White.

PUMPKINS.

A few crosses have been made and are being followed up, but the stabilisation of a strain or strains of the so-called Beaudesert Pumpkin is the chief concern at present. Progress has been much hampered by adverse seasons and the presence of nematode in the soil.

The method adopted in connection with pollination is as follows:—

If selfing is to be practised, the evening before the flowers open a string is put round each of them, a male and female, if possible on the same runner, and drawn sufficiently tight to prevent opening. In the morning the string, which, by the way, should have been put on close to the point of the flower, if further tightened cuts off the top of the flower, exposing the male or female organs as the case may be. If the morning is bright, in the male flower, which should be the first treated in this way, it will be observed that the anthers have dehisced and a lot of loose pollen has collected at the base. By careful breaking back the corolla, but so as to still retain the pollen, it can be made sufficiently small to permit of its introduction to the reproductive organs of the female flower without undue interference to its corolla, which is essential, as this has to be again tied up after the operation to prevent contamination by foreign pollen through insect or other agencies.

OTHER CROPS.

Field Peas.

The dry winters experienced here are not as favourable for the development of this crop as in the Southern States or more favoured portions of Queensland. Nevertheless a fair amount has been accomplished since 1924 when the work was first taken up, and at present some ten promising selections resulting from crossing Paragon (Field Pea) and Improved Stratagem are under observation.

Soudan Grass.

Work in connection with this crop was commenced in 1920, consisting chiefly in isolating several strains, some of which appeared to be the result of sorghum crossing, and having them tested by the Agricultural Chemist in order to ascertain their suitability for stock at varying stages in their growth under varying conditions.

Unfortunately, owing to a run of adverse seasons and the lack of conveniences for watering, the results were lost, only one strain being saved, which is under observation this season.

Citrus Fruits.

At present we have under observation twenty budded trees mostly "grape" fruit crosses made in 1923.

In order to expedite this work as soon as the seedlings are large enough to furnish buds so are they budded on to suitable stocks.

This section of the work has also suffered owing to lack of water, a number of crosses in which the Washington Navel orange was the female parent having been lost.

Grapes.

Crossing was first done in 1920, and a number have been made since with the result that at present there are two or three rather promising plants under observation.

Owing to the time which must elapse before a seedling gives a reliable showing on its own stock, grafting is to be the practice in future.

As some of our own seedlings appear to be little affected by nematode, more especially those resulting from crossing Cinsant with Rupestris, they are to be used as the stocks.

The crosses have been many and varied, but as with other crops, owing to the unfavourable conditions and lack of facilities for watering more plants have died than have matured.

One of the original crosses affords a most wonderful illustration of "heterosis."

It was put out in a row of vines where one had died which had been planted twenty years previously. The whole row of the vines at the time looked sickly, the most robust not producing wood more than 6 feet in length and very spindly at that. Last season the seedling produced many shoots over 30 feet in length of a stoutness in proportion and a fair crop of fruit.

Peanuts.

No crossing has been attempted in connection with this crop, but all varieties are being tested. Plan of 1929 sowing follows.

Different kinds of pegs are used for marking the positions of the emasculated and pollinated flowers in the field. When fecundation has been accomplished oiled labels are attached on which appears the cross made, parentage, &c., and when made. This and any other notes are recorded in field book.

Border Row.

Range 9.	5	6	7	8	9	10	0	1	2	3	4
Range 8.	3	4	5	6	7	8	9	10	0	1	2
Range 7.	1	2	3	4	5	6	7	8	9	10	0
Range 6.	10	0	1	2	3	4	5	6	7	8	9
Range 5.	8	9	10	0	1	2	3	4	5	6	7
Range 4.	6	7	8	9	10	0	1	2	3	4	5
Range 3.	4	5	6	7	8	9	10	0	1	2	3
Range 2.	2	3	4	5	6	7	8	9	10	0	1
Range 1.	0	1	2	3	4	5	6	7	8	9	10

Border Row.

Rows 4 feet apart.

Plants 2 feet apart.

Fifteen plants to row.

Thirteen used to determine yield.

Varieties O.

0. Office Threes
1. Wilson's Sel. 1
2. Wilson's Sel. 2
3. Wilson's Sel. 3
4. Wilson's Sel. 4
5. Wilson's Sel. 5
6. Wilson's Sel. 6
7. Wilson's Sel. 7
8. Wilson's Sel. 9
9. Wilson's Sel. 9
10. Wilson's Sel. 10

QUEENSLAND SHOW DATES.

Imbil: 3rd and 4th September.
Malanda: 5th and 6th September.
Gympie: 10th and 11th September.
Redcliffe: 12th and 13th September.
Noosa (Pomona): 17th and 18th Sept.
Beenleigh: 19th and 20th September.
Rocklea: 27th September.
Esk Campdraft: 26th and 27th September.
Kenilworth: 27th September.
Southport: 3rd and 4th October.
Enoggera: 4th October.
Nerang: 10th October.

TOBACCO GROWING IN NORTH QUEENSLAND.

MINISTERIAL ANNOUNCEMENT.

THE Minister of Agriculture and Stock, Hon. Harry F. Walker, has announced that for the past three years experiments in tobacco growing have been carried out under the auspices of the Australian Tobacco Investigation Committee. This body, of which Mr. C. M. Slagg, M.S., is the Director, has carried on its work out of funds provided by the Commonwealth and State Governments conjointly with the British-Australian Tobacco Company, which company has substantially subsidised the project and has been largely instrumental in the developments that have taken place. Experimental plots have been tested under the direction of the Department of Agriculture and Stock in widely separated areas, ranging from Bowen to Mareeba in the north and to Pentland in the west. The problem to be solved was to find soils suitable for producing a bright tobacco, of good burning qualities and with an agreeable burning aroma, such as would prove acceptable to the cigarette and pipe-smoking public. The results of these experiments have so far proved eminently satisfactory. It has been established that such a tobacco can be produced on the poor granitic soils in the vicinity of Mareeba, in North Queensland. There is ample Crown land available there and the climatic conditions are suitable. The experiments have enabled the Department of Agriculture and Stock to lay down the right proportions of chemical plant foods required to be added to the soils to produce the class of tobacco which the market requires.

The annual Australian consumption of cigarette and pipe tobacco is about 20,000,000 lb. The British-Australian Tobacco Company has intimated that it will purchase all tobacco of the right quality grown in Queensland at remunerative prices.

A farmer, generally speaking, can cultivate and cure about 5 acres of tobacco with his own labour. The produce of an acre should not be less than about 500 lb. so that at, say, 2s. 6d. per lb. the gross return from an acre should be about £62 10s., The price mentioned is an arbitrary one and must not be regarded as in any way being a guaranteed one.

Farms at Mareeba.

The Government is convinced that an important industry can be secured for North Queensland by the encouragement of tobacco growing in the Mareeba district. The prospects of the development of the industry have been investigated by the State Consultation Committee on Developmental Proposals which has recommended to the Government that thirty tobacco farms, near Mareeba, be made available to approved applicants for cultivation under tobacco during the coming season which lasts from December to March.

Accordingly instructions have been given to a surveyor and an officer of the Department of Agriculture and Stock, experienced in the results of the tobacco experiments, to design thirty tobacco farms in the locality mentioned. Each farm will have about 60 acres of arable land suitable for tobacco and an area of grazing land up to 200 acres wherever practicable. As the quality of the land is poor it must be definitely stated that the possibility of a farmer making a living out of anything but tobacco is remote.

Land Available.

It is expected that the design of the farms will be available almost immediately. If the land is to be ready for cultivation by December it will be necessary for the successful applicants to get on to their farms immediately in order to clear, stump, and cultivate 5 acres for planting in December.

So that there shall be no delay the Government has arranged with the Land Administration Board to open the farms for Agricultural Homestead Selection under the group system at a purchasing price of 2s. 6d. per acre. Opening under the group system involves the allotting of the lands to successful applicants before the lands are formally opened. It also involves personal residence on the farms on the part of the selectors. Each successful applicant will be required to enter on his farm forthwith and proceed with the clearing and stumping of 5 acres.

Experienced Men Preferred.

Applications, which closed on 31st August, have been received from persons desirous of competing for inclusion as members of the group to which the farms will be allotted. In allotting the farms preference will be given to persons who have had farming (preferably tobacco-growing) experience, who have sufficient capital to carry them on for a year or two, and who will undertake to cultivate

5 acres under tobacco during the coming season from December to February. Each applicant should therefore include in his application particulars of his qualifications under these headings.

Each successful applicant will be assured of the utmost assistance of the officers of the Department of Agriculture and Stock who are versed in the cultivation and treatment of tobacco. These officers will give advice regarding the growing and curing of the tobacco crop.

The Government intends from time to time to make further tobacco farms available to the public.

An important feature of the prospective tobacco growing industry is that the growing period coincides with the slack season in the North Queensland meat and sugar industries and thus ample labour will be available.

TOMATO GROWING IN NORTH QUEENSLAND.

By E. F. DUFFY, Instructor in Fruit Culture.

The principal area for the production of tomatoes for the Southern markets extends from Langford Creek to Wakala, with the main production in the delta of the Don River, at Bowen.

Farmers at the Proserpine districts and also on the delta of the Burdekin River are going in for this crop. Planting begins in January with the first early plot, and go on to May and June for the late crops. Staking of the plants is not at all practised. The plants are put out at distances of 9 by 9 feet, and in some instances further apart. When grown under good conditions the plants cover the whole of the intervening spaces. The Bowen Buckeye, Livingstone Glove, and Burwood Prize are varieties which have mostly been grown. First place is given to the Buckeye variety. Generally speaking, there is an absence of fungoid troubles which attack tomatoes in other districts, nor do they suffer from wet rot which causes so much trouble in other districts where more frequent and higher rainfalls occur.

Consignments carry to Melbourne and Adelaide without losses and in satisfactory condition. A good start with the areas is always achieved during the summer rains, and with the subsequent winter rain which can be generally depended on, good harvesting goes on to October and November.

One of the greatest pests in all light soils is the nematodes which cause the failing or knotting of the roots.

Many of the growers resort to the making of a good log fire on the ground where the seed-beds are to be made.

This presents itself as a good, ready means of destroying the nematodes and thereby giving the young plants a clean start, and also of cleaning the ground of fungus which may cause damping off, or the verticillium fungus which attacks the young plants.

Sterilisation of the beds with formalin is also to be recommended for the achievement of this purpose. The other pest which causes so much heavy losses in tomato growing generally is the larvæ of the Heliothus moth.

If growers would spray or dust the young beds twice before moving the plants with a combined arsenate of lead and Bordeaux preparation, and also do the same three times at intervals after planting out up to the setting of the first fruit, and gather all affected fruit both large and small during the first two "skim" pickings, a big control of this pest would be kept.

The eggs are laid on the young bushes and the larvæ feed on them, and subsequently the eggs are laid on the base of the flowers and on emergence of the young larvæ they bore straight into the young fruit. It is therefore apparent that control measures taken as above would check the subsequent multiplication later on.

Care should be taken in the dying of the young plants in the seed-beds, so that as little damage as possible is done to the roots of the plants, and thereby prevent as much as possible entrance of the fusarium fungus which is responsible for wilt.

The necessity, of course, arises for the application of a complete manure on land which has been under the crop year after year, and the ploughing-in of a green crop when possible for the keeping of a sufficient supply of humus and nitrogen in the soil. Legumes were considered most suitable for the purpose, but as they serve to perpetuate nematodes, other green crops are resorted to and, amongst these, maize (broadcasted) provides, when ploughed in before reaching its maximum growth, a good supply of humus, the nitrogen being applied in concentrated form preferably before sowing the maize.

FRUITGROWING AT HERBERTON.

Mr. C. Harding, who is well known in horticultural circles in the North, has supplied the following notes on his twenty years' experience in fruitgrowing in the Herberton district:—

Locality: Three miles south from town of Herberton.

Temperature: As much as 16 to 18 degrees of frost, followed by a dry spring.

Soil: River flats. With the exception of grapes, no results were obtained until a liberal quantity of lime was applied. Trees blossomed, but the fruit did not set.

Grapes do well, both on the alluvial river flats and red volcanic soil. I suggest manuring with an artificial manure comprising 10 per cent. of potash. This is a great factor in producing a sweet grape. Varieties: Gotha, Ferdinand de Lessep. These varieties were sent to the district twenty years ago by Mr. A. H. Benson. Many others do well, but the grower's object should be a grape that will stand transit and the thunderstorms. The Wilder Isobel and White Portugal are good main crop grapes.

Plums were shy bearers until the trees assimilated the lime, at first only bearing twenty to thirty fruit. The next year they bore from one to two hundred, while this year they are carrying up to two hundred dozen or more per tree. I strongly recommend the Kelsey—an exquisite and luscious fruit, readily saleable at 1s. per lb. Fruit weighing 6 oz. have been picked this season. Other varieties tried were Red Heart and Satsuma. They bear good crops of fruit, but from a quality point of view are not in it with the Kelsey. These are protected from the fruit-fly with netting.

Apricots are strongly recommended, especially all the early varieties including Moor Park and New Castle. The beauty of this fruit is that it matures before the fruit-fly becomes active, being ripe the second week in November, and no protection is required.

Pears are now being tried and will be a success. Those tried and now bearing heavily are Keifeers and Hybrid. The higher class of fruit is doing well.

Persimmons do exceptionally well, and the trees are heavily laden every year. Both early and late Japanese varieties are recommended.

Two Pecan nut trees were sent to the locality twenty-five years ago by Mr. A. H. Benson; they are now 30 feet high and bearing good crops.

All trees should be given a liberal supply of water at the end of July and August. To be successful it is essential that trees be kept clean, and attention must be paid to the use of appropriate fertilisers. These remarks only apply to this particular locality. Growers must experiment and get varieties of fruit suitable to their localities. My experience will not allow me to recommend apples.

HANDY TAPE GRIP.

The tape commonly used by surveyors is hard to hold, especially when the hands are cold. The sketch shows a pistol grip that was cut from a tree branch. It measures about $\frac{3}{4}$ inch in diameter, and is attached to the reel case by means of

two strips of sheet metal, $\frac{5}{8}$ inch wide. The strips are attached to the case by rivets, which pass through the rim of the case so that they are not in the way of the tape. Two rivets secure the strips to the handle. The grip is especially handy in unwinding or rolling the tape.

THE CARE OF THE CAR.

THE motor car battery consists essentially of a number of cells, three in the case of a 6-volt battery and six in the case of a 12-volt battery. These cells are usually contained in a common box, but each cell is a separate compartment from its neighbour.

Each cell has a non-metallic tank, usually a rubber compound. This cell contains a liquid known as the electrolyte and a number of positive and negative plates. The positive plates are connected to the positive terminal on the top of the cell and the negative to the negative terminal. The plates are made of specially cast lead that has been covered with special pastes of lead oxide. To understand the chemical actions in which these plates are involved, a knowledge of electro-chemistry would be required, which is something the average motorist does not possess, nor would it be of any great practical value to him if he did. The lead plates are so made that they present a large surface for the active material or paste to adhere to. The main constituent of the positive plate paste is red lead, while that of the negative plate is litharge. In the process of making the battery elecric currents are passed through these plates but, ultimately, when the battery is supplied to the motorist it is fully charged and the positive plate presents a grey appearance (it has an outer layer of spongy lead), whereas the negative plate has a dark chocolate-brown appearance (its outer layer is of lead peroxide).

The electrolyte is sulphuric acid diluted with the purest of water, that is, distilled water. The strength of this solution of acid and water is of vital importance to the operation of the battery. Sulphuric acid is considerably heavier than water so that the strength of a mixture of the two may be judged by the weight of the mixture as compared with the weight of an equal quantity of water. This comparative figure is known as the specific gravity. Water is taken as the standard and thus if the specific gravity of a liquid be given as 1.5 then that liquid is 1½ times as heavy as water.

The specific gravity is measured by a simple instrument known as an hydrometer, which is really only a calibrated glass rod weighted at one end. When this rod is floated in a liquid the depth to which it will sink will depend upon the density of the liquid, so that it is a simple matter to calibrate the rod to measure specific gravity. Sulphuric acid consists of hydrogen and a combination of oxygen and sulphur, which is known as sulphate. Now when a battery is fully charged all the sulphatae is in the electrolyte, whereas when the battery discharges the sulphate is removed from the electrolyte and combines with the lead on th plates to form lead sulphate on both plates. When the battery is fully discharged all the sulphate is removed from the battery and the electrolyte becomes practically water.

Care of the Battery.

The plates of the battery should never be left for any length of time exposed to the atmosphere, and as the water in the electrolyte evaporates it must be made up from time to time or the plates will not be kept covered. Only distilled water should be used when making up the battery, and this distilled water should never be stored in a metallic container, as a trace of metal in the water will cause chemical actions in the battery, which will greatly shorten its life. The electrolyte level should be kept about an eighth of an inch above the tops of the plates.

A battery should never be left for any length of time discharged, as the lead sulphate on the plates forms into crystals, which will not disintegrate when an effort is made to recharge the battery. This happening is known as sulphation of the plates, and is a cause of the partial destruction of many batteries. Thus, if the driver knows that his battery is "flat" or nearly so, he should see to it that the battery is charged before the car is left idle for a few days.

Prolonged use of the starter when the engine will not start has a most injurious effect upon the battery, as the excessive current taken from the battery causes it to overheat and the plates are buckled. Also the sudden chemical action that occurs cracks up the lead sulphate and some of it drops to the bottom, where it is useless or possibly even a nuisance. If an engine does not start readily there is always some good reason for it, and it is a very poor driver who just keeps his foot on the starter and hopes for the best. The good driver only keeps the starter button pressed for three or four seconds, and if the engine has not then started, he will look for the cause of the trouble. When a battery is fully charged the hydrometer will register between 1.275 and 1.300, and the hydrometer reading should be checked when the distilled water is added. When the battery is discharged the hydromter reading will not be much more than 1.100. The number of times that a battery requires the

addition of distilled water varies with climatic conditions. As an example, in the hot, dry summers of the Western districts, the battery should be checked about once a week, whereas in cold weather, where the evaporation is very little, it is sufficient to check monthly.

The life of the battery depends very greatly upon the service to which it is subjected. As an example, the average country driver usually makes long trips, which means that the battery is charged for long periods, and that the starter is used but little. On the other hand, the city driver may use his starter very frequently, with the result that the battery is discharged much more rapidly than it is charged. When this is the case, the battery should be re-charged at a service station periodically. It is well to remember that the acid used in the battery is remarkably corrosive, and will destroy any clothing it touches, and will burn the skin and even ruin the eyesight should any of it be splashed in the face.—RADIATOR in "The Farmer and Settler."

ABSTRACTS AND REVIEWS.

The Pig Breeders' Annual.

By a recent mail there came to hand the 1930-31 edition, Volume 10, of the Pig Breeders' Annual, published by the National Pig Breeders' Association, the largest and most representative stud pig-breeding society in Great Britain. Published in England and available to readers here at 3s. 6d., post free, the Annual represents excellent value, and should appeal equally to all who have an interest in pig breeding and feeding, no matter what breed they keep or in what country they reside. Breeding, feeding, management, marketing, and veterinary questions are dealt with by the most competent authorities, while the statistical section has been earfully revised and much valuable matter added. The illustrations of various breeds of pigs and of pigsty buildings and labour-saving appliances, together with the illustrated advertisements from a wide range of breeders, give to the volume added value from the point of view of the Australian farmer, while the reviews of pig breeding activities in various countries will be read with considerable interest by breeders anywhere.

The President of the Association this year is Major Clive Behrens, a prominent and successful farmer and an authority on all phases of the industry. The Foreword, by the Right Hon. Noel Buxton, M.P., late Minister of Agriculture and Fisheries, London, indicates the position of the pig industry in the Mother Country, and reviews the activities of different organisations specially interested in progress.

Articles of special interest to Australian breeders include, "The Future of Co-operative Bacon Factories in England," by David Black, Chairman of St. Edmundsbury Co-operative Bacon Factory, "Pig Prices," by Major E. R. Orme, of the Markets Division of the Ministry of Agriculture, "Common Ailments of Pigs," by Major C. G. Saunders, D.S.O., B.V.Sc., M.R.C.V.S., "Iodine in Pig Feeding," by Frank Ewart Corrie, B.Sc., M.D.A., N.D.D., "Litter Size, Is it Inherited?" by A. D. Buchanan Smith, M.A., M.S.A., B.Sc., of the Animal Breeding Research Department of the University of Edinburgh, "Observations of the Nutrition of Breeding Pigs," by those wellknown authorities, Dr. J. B. Orr, D.S.D., M.A., D.Sc., N.D.A., and H. R. Davidson, M.A., Department of Agriculture of the Rowett Research Institute, Aberdeen, "Empire Pork and Bacon," by E. H. Callow, Ph. D., B.Sc., A.I.C., "Experiences of Pig Testing in Scotland," "Dentition of Pigs," "The Work of the Harper-Adams Pig Feeding Experimental Station During 1929," "The Pig Industry and Young Farmers' Clubs," "Costs of Feeding on an Open Air Pig Farm," articles on "Pig Breeding Activities" in Sweden, in North America, in New Zealand, and "Pig Production as a Business," the latter by E. J. Shelton, H.D.A., of the Department of Agriculture and Stock, Brisbane, Queensland, Australia.

The volume is crammed full of useful facts and information of value to every farmer, and the Annual is worthy of a place in every library, and especially of those progressive farmers whose business it is to keep themselves abreast of the times and in touch with fellow breeders in every part of the world. The publication comes out under the general editorship of Mr. Alec Hobson, the Secretary of the National Pig Breeders' Association, a man of wide experience and unbounded enthusiasm. While the supply lasts, copies may be had on application to Mr. E. J. Shelton, H.D.A., Department of Agriculture and Stock, Brisbane, or from the Association's offices at 92 Gower street, London W.C.1, England.

The Young Farmer.

POINTS FOR CLUB MEMBERS.

Primary Essentials in Calf Feeding.

There are certain points to which too much importance can hardly be attached in the feeding of dairy calves. The first is the need for scrupulous cleanliness with the feeding vessels. The buckets should be scalded thoroughly every time they are used, and so also should any feeding apparatus used. The second is absolute regularity as to feeding time, and the third absolute uniformity as to temperature. Neglect of these last two points has more to do with calves' troubles than many farmers have any idea of.

A healthy regularity is likely to be promoted by feeding at the same time every day, while varying temperatures are obviously detrimental to the delicate and tender organs of the alimentary tract. Attention to the last is most necessary where a number of calves have to be fed or where the weather is particularly cold. Many very successful rearers of calves insist on having boiling water available during the whole time the calves are feeding, so that a little can be added as required to keep the milk ration up to blood heat.

As the calves grow they should be encouraged to eat as much roughage, such as hay or chaff, as possible. The effect is to develop the barrel and increase the capacity of the digestive organs for dealing with large quantities of food and turning it into milk. The development of the digestive organs can be begun with little difficulty while the animal is young, but it is practically impossible to modify the shape and conformation of a heifer that has been neglected up to the time she is, say, twelve months old.

Productivity of Dairy Cows—The Best by Test.

There is only one infallible judge of the productive capacity of dairy cows, and the wise dairy farmer refers for a verdict to the Babcock tester. There is too small a margin of profit in dairying nowadays to waste money and time in milking cows that do not yield sufficient to pay their way, or to take any risk in determining which come into this category.

Sheer human negligence perhaps is the main reason why farmers do not join a herd-recording unit, but there are still those who flatter themselves that they can tell what a cow produces merely on the animal's outward appearance, such as body formation, the size of the milk veins, and size and shape of the escutcheon. Judgments so based, however, have been repeatedly proved unsound, and the disparity between what the animal is estimated to produce and what she actually produces is frequently enormous. Valuable cows may as a consequence be got rid of, while fancy prices may, on the other hand, be paid for those not worth their salt.

There is one sufficient argument in favour of herd-recording—it pays. If it is used intelligently and systematically in conjunction with other means of herd improvement, the profit per cow can be very appreciably increased. Taking a dairy of forty cows, and estimating butter to the farmer at 1s. 6d. per lb., it will be seen that even a moderate increase in production per head has an appreciable effect on the farm income:—

Increase per cow.	Added farm income.
10 lb. butter	400 lb.—£30
20 lb. butter	800 lb.—£60
50 lb. butter	2,000 lb.—£150
120 lb. butter	4,800 lb.—£360

Every country in which dairying by modern methods is engaged in affords evidence of the benefits of herd-recording, but some striking enough figures are provided by our own farmers. Mr. E. P. Filmer, of Bimbaya (South Coast, New South Wales), recently furnished the information that as the result of eight or nine years' continuous recording he had been enabled to increase the average yield per cow from 180 lb. to just on 250 lb. of butter per annum, and this with a herd ranging from 95 to 100 head. A very simple calculation will show whether or not that improvement justified the expense of herd-recording, and the time and thought involved in the culling of the herd.

YOUNG FARMERS AT THE SHOW.

Twenty-five boys selected from the Schools Project Club of Queensland and ten representing the Junior Farmers' Clubs of New South Wales formed a farm boys' camp at the Exhibition Grounds, and thus was spent an instructive holiday at the Brisbane Show. Mr. T. L. Williams, who has been associated with the camp for three years on behalf of the Royal National Association, was again manager, and he had the valuable co-operation of Mr. G. M. Blacklock, manager of the Sydney contingent.

The lads were quartered on the grounds, and paid regular visits to different sections of the Exhibition. Several of the boys displayed a canny knowledge of cattle value, and largely anticipated the decisions of the judges with remarkable success.

In the John Reid hall the boys were taken in hand by Mr. M. P. Campbell, of the Chamber of Manufactures. Through the instrumentality of Mr. Campbell the Chamber of Manufactures had offered prizes of 30s. and 10s. for the best essay written by the boys of the Farm League on the exhibits in the John Reid hall. A similar prize had been offered by Messrs. C. F. Thompson and Co., bedding manufacturers, of South Brisbane, for an essay written by the boys on their particular exhibit.

Address by the Minister.

During a luncheon interval the boys were addressed by the Minister for Agriculture (Mr. H. F. Walker) on ideals of agriculture.

Mr. Walker said the lads had some hard work in front of them if they followed their avocations on the land, although those who worked hardest had the easiest time in the end. He said those on the land gained a freedom and independence of thought that was envied by those in other walks of life.

The Minister touched on many of the problems confronting primary producers, and said that in the early days some of the settlers worked and developed their land without much capital, and to-day were most prosperous.

"Queensland offers you great possibilities on the land," he added, "particularly in the Burnett areas, where cotton-growing is making rapid progress. We can grow tobacco here and save tremendous sums of money going out of the country each year. We also have wonderful opportunities of developing dairying and mixed farming, and following the splendid example last year, we can make a big increase in production."

The question of organised marketing was also explained to the lads, who were told that this would solve many of the farmers' problems.

The Boys.

Boys comprising the contingent included—Queensland:—Barrine, Charles B. Davis; Boonah Rural, Athol McLaughlin; Cloyna, Gordon Benson; Colinton, Anthony Peters; Eidsvold, Desmond Horn; Federal, Errol Head; Glencoe, Colin Storey; Gowrie Mountain, James A. Brimblecombe; Gundiah, Irwin White; Hatton Vale, Eric Knopke; Ideraway, Edward Gishford; Jarvisfield, Fred Ward; Jinghi Gully, Kenneth Sullivan; Killarney, Mervyn Hansen; Maleny, Harry P. Cranney; Mapleton, Ronald Pack; Mount Alford, Hector Stenzel; Palmwoods, Sidney Rann; Peeramon, George Imrie; Pimpama Island, Roy Wonders; Taabinga Village, Raymond Woodall; Tannymorel, Cyril Bull; The Caves, John White; Winya, Donald Fogg; Yamsion, Albert Koehler.

New South Wales:—Dorrigo, T. Harvey; Glen Innes, R. Berman; Kempsey, William Daley; Quirindi, George Williams; Singleton, Malcolm Shearer; Tenterfield, William G. Foster; Armidale, Owen Wallis; Tamworth, George Cook and Jim Meadows; and Scone, Roy Goodworth.

A FUND OF INFORMATION.

A Proserpine farmer writes (19*th August*, 1930):—"*I am a regular subscriber to the "Queensland Agricultural Journal," for the man on the land it is a fund of information.*"

Answers to Correspondents.

Rotted versus "Green" Cow Manure.

C. T. K. (Scarness)—

The Agricultural Chemist, Mr. J. C. Brünnich, advises:—The use of fresh cow manure or any excreta will encourage the growth of weeds. The farmyard manure properly prepared and matured by a process of fermentation and action of bacteria produces the plant foods in a better form, contains more nitrogen, and the vegetable matter is much more suitable for mixing with the soil, forming humus more readily, and encourages the growth of beneficial micro-organisms, &c. By the rotting process the vitality of the seeds is generally destroyed.

Roup.

J.A.L.S. (Barrine, N.Q.)—

From the symptoms described (combs turning black and a yellow discharge from the bird's throat), the disease appears to be a case of roup in one of its many forms. This disease could be prevented by keeping poultry under strict sanitary conditions, with ample ventilation, at the same time avoiding draughts, and with plenty of roosting space. A good germicide is obtained from the following mixture:—Dissolve 3 oz. of bluestone in a gallon of water. Dose: one cupful to each 4 gallons of drinking water daily. This germicide will prevent the disease from spreading from bird to bird through the medium of the drinking water.

Silage Requirements.

INQUIRER—

A herd of thirty cows will require 160 to 170 tons of silage if fed on it throughout the whole year.

A silo 12 feet diameter and 30 feet high will hold 68 tons; a silo 14 feet in diameter and 35 feet high will hold 117 tons.

It would require approximately 15 acres of green maize to fill the two.

Veterinary Questions Answered.

H.H.R. (Tumoulin, N.Q.)—

Mr. J. A. V. Rudd, of the Veterinary Staff, supplies the following answers:—

(1) *How soon after calving should a cow be washed out?*

If a cow calves normally there is no necessity to interfere with her in any way. As a matter of fact, she would be much better off if she was left alone.

(2) *When castrating a pig recently, after cutting through the first skin, a brownish, jelly-like substance appeared; then, when cutting the string of the testicle, I had to cut it away from a hard pus. What would these symptoms indicate?*

The jelly-like substance was serous exudate, the product of inflammatory action, probably due to the presence of pus near the testicle.

(3) *Some time ago five young cows died, apparently on their feet. There was no swelling. On opening them, I found that the entrails contained a little water. The cows passed much more liquid than solids. Do these symptoms indicate that the cows were poisoned, and, if so, could a bone analysis be made to determine the cause of death?*

The cows apparently died of arsenical poisoning. It is possible to find mineral poisoning if the intestines and their contents were subject to analysis. This is done in this Department by the Analytical Branch in Brisbane.

Wattle for Tanning.

F.A.T. (Nanango)—

The specimen of wattle is *Acacia glaucocarpa*, one of the feather-leafed wattles allied to those of the decurrens group which are the principal ones at present used in tanning. So far as analysis goes, the species you sent has generally given a fairly high tannin content (about 26 per cent). If you want to dispose of the bark, we would advise you to write to the Secretary, Master Tanners' Association, Brisbane.

General Notes.

Staff Changes and Appointments.

The following have been appointed members of the Southern District Stallion Board:—Major A. H. Cory, M.R.C.V.S. (Chairman), Messrs. Ernest Baynes, P. Short, and J. Sprott.

Constables H. H. Eiser and W. E. Lynam, stationed at Sapphire and Duchess respectively, have been appointed Inspectors of Slaughter-houses as from the 2nd August, 1930. The services of Mr. J. C. Pryde, Temporary Inspector of Stock at Coolangatta, have been continued from the 22nd July to the 2nd September, 1930.

The appointment of Mr. L. F. Mandelson as Assistant Pathologist has been confirmed as from the 1st January, 1930.

Acting Sergeant T. J. Peterson, stationed at Oxley, has been appointed an Inspector of Slaughter-houses as from the 26th July, and the Officer in Charge of Police at Yelarbon has been appointed an Acting Inspector of Stock as from the same date.

Mr. J. H. B. Goldie has been appointed Millowners' Representative on the Childers Local Sugar Cane Prices Board, vice Mr. C. R. Fletcher, resigned.

The following transfers of Cane Testers and Assistant Cane Testers have been approved:—

(*a*) *Cane Testers:*
- Miss J. Orr, from North Eton Mill to Cattle Creek Mill;
- Mr. J. C. D. Casey, from Cattle Creek Mill to North Eton Mill.

(*b*) *Assistant Cane Testers:*
- Miss T. Payne, from North Eton Mill to Racecourse Mill;
- Miss D. Bowder, from Millaquin Mill to Plane Creek Mill;
- Miss R. Rowe, from Plane Creek Mill to Millaquin Mill.

His Excellency the Governor in Council has approved of the following appointments under "*The Banana Industry Protection Act of* 1929":—

Name.	Appointment.	Present Position or Address.
W. J. Ross	Chief Inspector ..	Senior Instructor in Fruit Culture
H. G. Crofts	Secretary (in acting capacity for six months)	Clerk, Head Office, Department of Agriculture and Stock
S. E. Stephens ..	Agent (in conjunction with present position)	Instructor in Fruit Culture
C. G. Williams ..	Agent	Inspector under Diseases in Plants Act
J. A. Stockdale ..	Agent	Inspector under Diseases in Plants Act
S. A. Green	Agent	Inspector under Diseases in Plants Act
D. McLaurin	Agent	Inspector under Diseases in Plants Act
K. King	Agent	Inspector under Diseases in Plants Act
E. L. V. Filer	Agent	Assistant Fruit Branch, Department Agriculture and Stock
P. Mitchell	Agent	Temporary Inspector Diseases in Plants Act
J. H. Mitchell	Agent	Temporary Inspector Diseases in Plants Act
E. L. Miles	Agent	Temporary Inspector Diseases in Plants Act
F. A. Drake	Agent	Experimental Station, Bartle Frere
C. N. Morgan	Agent	Goombungee, *via* Toowoomba
W. G. Hancock ..	Agent	Wellington Point
A. J. Browne	Agent	Gregory terrace, Brisbane
J. McG. Wills	Agent	Bauer street, Southport
L. L. S. Barr, B.Sc. Ag.	Agent	River terrace, Kangaroo Point

Of these appointments, those of Messrs. P. Mitchell, J. H. Mitchell, E. L. Miles, F. A. Drake, C. N. Morgan, W. G. Hancock, A. J. Browne, J. McG. Wills, and L. L. S. Barr will be on probation for a period of six months. Any of the appointees who already hold the position of Inspector under the Diseases in Plants Act and/or Inspector under the Pest Destroyers Act will continue to hold those positions as subsidiary to their new appointments.

Mr. J. G. Scholefield has been re-appointed Government Representative, and Messrs. J. A. Milson, J. R. Coghlan, N. Marlay, and H. H. Hamilton have been appointed Members on the Boulia Dingo Board.

Messrs. W. R. Burnett, D. Culhane, and T. Douglas, Inspectors of Stock, have been appointed also Inspectors of Brands, and Messrs. D. Culhane, T. Douglas, and H. J. D. McBean, Inspectors of Stock, have been appointed also Inspectors of Slaughter-houses.

Mr. J. R. Canty has been appointed a Temporary Inspector of Slaughter-houses for the period from 21st July to 31st August, 1930.

The following transfers of Inspectors of Slaughter-houses have been approved:— N. Custance, from Townsville to Warwick; N. Flanagan, from Bundaberg to Townsville; H. J. Walker, from Brisbane to Bundaberg; S. C. Smith, from Mareeba to Cairns; H. F. Sibley, from Charters Towers to Mareeba; A. Black, from Oxley to Charters Towers; and G. P. Randles, from Zillmere to Oxley.

Acting Sergeant W. Cook, stationed at Nanango, has been appointed an Inspector of Slaughter-houses. Mr. W. D. Lewis, Temporary Inspector under the Diseases in Plants Act, attached to the Departmental Picking-over Shed, has been appointed an Inspector, on probation, under the Diseases in Plants Act. The headquarters of Mr. J. N. Jones, Temporary Ranger under the Animals and Birds Acts, have been transferred from Mungindi to Miles.

Western Downs Dingo Board—Additional By-laws.

By-law No. 19 of the Western Downs Dingo Board has been approved. This by-law provides that the Board shall only grant one permit for dingo and marsupial destruction for every 5,000 acres of a holding. This by-law will be in force in the Western Downs Dingo District as from the date of Gazettal, that is, 9th August, 1930.

Levy for Banana Board.

An Order in Council under "*The Banana Industry Protection Act of* 1929" has been approved providing for a levy on all banana growers for the maintenance of the Banana Industry Protection Board. The assessment will be levied on growers of bananas at the rate of one penny halfpenny (1½d.) per case containing one and a-half bushels or less, and at the rate of one penny halfpenny (1½d.) per three busheds of cavendish, five bunches of lady's finger, or six bunches of sugar bananas. With respect to bananas marketed in Queensland the levy shall be collected by means of a deduction made by all commission agents, commodity boards, merchants, or other persons from proceeds of sales of bananas, the amount so accruing to be remitted by such commission agent, &c., to the Under Secretary, Department of Agriculture and Stock, Brisbane, not later than the seventh day of each month in respect of all bananas sold or purchased during the preceding month. With respect to bananas marketed elsewhere than in Queensland the method of collection shall be by means of the Committee of Direction of Fruit Marketing or the Commissioner of Railways adding the sum of 2s. 10d. (two shillings and tenpence) per ton to the freight charges on such bananas, such amounts collected to be remitted as above. This assessment will come into operation on the 2nd August, 1930.

Levy for Maintenance of Banana Experimental Stations.

An Order in Council under "*The Primary Produce Experiment Stations Act of* 1927," has been approved providing for a levy on growers of bananas for the maintenance of the Banana Experiment Stations at Kin Kin East and Bartle Frere. The assessment will be levied on growers of bananas at the rate of three farthings (¾d.) per case containing one and a-half bushels of bananas or less, and at the rate of three farthings (¾d.) per three bunches of cavendish, five bunches of lady's finger, or six bunches of sugar bananas. With respect to bananas marketed in Queensland the method of collection shall be by means of a deduction to be made by all commission agents, merchants, commodity boards, or other persons from proceeds of sales of bananas, the amount so accruing to be remitted by such commission agent, &c., to the Under Secretary, Department of Agriculture and Stock, Brisbane, not later than the seventh day of each month in respect of all bananas sold or purchased during the preceding month. With respect to bananas marketed elsewhere than in Queensland the method of collection shall be by means of the Committee of Direction of Fruit Marketing or the Commissioner for Railways adding the sum of one shilling and fivepence (1s. 5d.) per ton to the freight charges on such bananas, remittance to be made as above.

Cheese Board Election.

The result of the voting in connection with the election of five growers' representatives on the Cheese Board was as follows:—

Division No. 1—

Thomas Dare (Narko)	89 votes
Gilbert Julius White (Maclagan)	58 votes
David William French (Sunnyvale, Bell)	28 votes

Division No. 2—

Henry Thomas Anderson (Biddeston, Oakey)	135 votes
William Thomas Harris (Toowoomba)	46 votes

Division No. 3—

Alfred John Harvey (Pittsworth)—Returned unopposed.

Division No. 4—

David Gabriel O'Shea (Southbrook)	108 votes
Albert George Tilley (Rosehill)	60 votes
George Burton (Cambooya)	34 votes

Division No. 5—

Arthur Pearce (Coalstoun Lakes)—Returned unopposed.

Messrs. Dare, Anderson, Harvey, O'Shea, and Pearce will therefore be appointed for a term of three years as from the 1st August.

Peanut Board Referendum and Election.

The question of the constitution of a Peanut Board to deal with all peanuts grown for sale, instead of from one half an acre and upwards as at present, was submitted to peanut growers and the following is the result:—

For	346 votes
Against	62 votes

The election of members to the Board for the respective districts was also carried out at the same time with the following results:—

District No. 1 (Wienholt and Nanango).—	Votes.
Frederick Christian Petersen (Kingaroy)	165
Charles Frederick Adermann (Wooroolin)	157
John Wesley Johnston (Wooroolin)	110

District No. 2 (Central Queensland).—

Alfred Skinner Clark (Sandhills)	57 votes
Reuben Johnson (The Caves)	39 votes

District No. 3 (Rest of Queensland).—

Albert George Whiting (Atherton)	46 votes
Albert Charles Perske (Degilbo)	31 votes

The necessary steps will be taken for the constitution of the new Board as from the 1st September, and the appointment of members thereto from that date.

Messrs. Petersen and Whiting will hold office for a term of two years, and Messrs. Adermann and Clark for one year.

Marketing of Tomatoes.

On the 31st July the Committee of Direction issued a Tomato Direction, to come into operation as from the 15th September to the 15th December, 1930. Petitions have now been received from various districts asking that an Order in Council be issued by the Governor in Council declaring that the tomatoes to which the direction relates shall be acquired by the Committee of Direction as the owners thereof. The tomatoes to which the direction relates will be all tomatoes grown for sale from the 15th September, 1930, to the 15th December, 1930, in the district from Nambour in the north to the New South Wales border in the south, to Rosewood in the west and the Pacific Ocean in the east, including the islands in Moreton Bay. A Regulation (No. 199 under the Fruit Marketing Organisation Acts) has now been issued to govern the poll to decide whether or not the Order in Council giving the Committee of Direction the power to acquire the tomatoes shall be issued.

The Committee of Direction is to conduct the poll, and all voting papers must be returned so as to reach the Committee of Direction not later than the 30th August, 1930, at noon. All persons in the district concerned who are growing tomatoes for sale on a wholesale basis will be eligible to vote, and, to insure their names being on the roll, growers are invited to send their names and addresses at once to the Committee of Direction of Fruit Marketing, Turbot street, Brisbane. The Committee of Direction is compiling the roll of persons eligible to vote from various sources of information, and the name of any person who satisfies the Committee of Direction that he is a "grower concerned" will be inserted on such roll.

Sugar Levies for 1930 Season.

Regulations have been passed under the Primary Producers' Organisation and Marketing Acts providing for levies on growers of cane in Queensland for 1930. There are levies providing for a Defence Fund, and for the administrative purposes of the Queensland Growers' Council, District Canegrowers' Executives, and Mill Suppliers' Committees, &c. Full particulars of these levies will be supplied to-morrow.

Extension of Operations of Cheese Board.

The present Cheese Pool was constituted in 1927 for a period of three years ending on the 31st July, 1930. By an Order in Council dated the 29th May, 1930, the Governor in Council gave notice that it was his intention to extend the duration of the Board for a further three years until the 31st July, 1933, and that he would receive, on or before the 30th June, 1930, a petition for a poll to decide whether or not the Board should be extended as intimated. As no petition was lodged, a poll was unnecessary, and an Order in Council has now been passed extending the operations of the Cheese Board for a period of three years as from the 1st August, 1930—that is, until the 31st July, 1933.

Angora Rabbits.

The Minister for Agriculture and Stock (Mr. H. F. Walker) has received further information through the Queensland Agent-General in Great Britain, which should be of interest to those persons who have taken up the breeding of Angora rabbits in this State.

The information furnished shows a somewhat better demand for first grade wool, and the price for this quality has risen 3s. or 4s. per lb., the current quotation being 28s. per lb.

The following price list is issued by the leading firm of spinners dealing with this commodity:—

Angora Rabbit Wool.

Extra super	28s. per lb.
Firsts	24s. per lb.
Seconds	17s. to 20s. per lb.
Thirds and matts	7s. 6d. to 10s. per lb.

Delivered at mill.

However, it is pointed out that possibly only the production of the very best wool would be profitable to Queenslanders, as consideration must be given to the incidental and other costs involved in export to such a distant market.

Buzacotts—A Successful Year.

Read at the annual meeting of the shareholders of Buzacotts (Queensland) Limited, machinery merchants, Brisbane, the directors' report stated that, notwithstanding the very difficult conditions which prevailed, particularly during the latter part of the year, turnover had been maintained, and the position of the company, both financially and otherwise, had shown an improvement. In the course of the year several new agency lines had been added to the company's already long list. Chief amongst these were the Howard Jnr. Rotary Hoe and Lightning Fruit Graders and Ethylene Gas. The reception of the Howard Jnr. Rotary Hoe by practical men had been most encouraging, and sales had reached a very high figure. The machine was instrumental in considerably lowering production cost, and its success in this respect can easily be gauged from the excellent results obtained by owners.

A large number of Lightning Graders had been sold and progressive growers were very keen on the introduction of Ethylene Gas, particularly for the colouring of mature citrus fruit. It was well known that in some localities the fruit, although actually mature and with the right sugar content, did not colour properly, and Ethylene here was indispensable. Cases were cited of the price of fruit increasing by at least 5s. per case after treatment with Ethylene Gas.

In moving the adoption of the report and balance sheet, the chairman (Mr. E. W. Buzacott) stated that he was confident that the shareholders would be pleased to see that the company had maintained its position and that the rate of dividend was to be the same as last year. He informed the meeting that the removal of the business to the company's own premises in Petrie Bight, next to Atcherley House, had been completed, and that the business had greatly benefited by this move. He stated that it was the unanimous wish of the board that there be placed on record their appreciation of the services rendered to the company by the entire staff under the capable management of Mr. R. D. Huish. The retiring directors, Messrs. E. W. Buzacott (Chairman), R. D. Huish (Managing Director), Alderman A. Watson, Messrs. F. G. Carr and F. W. Hiscox were re-elected on a unanimous vote.

The Home and the Garden.

OUR BABIES.

Under this heading a series of short articles by the Medical and Nursing Staff of the Queensland Baby Clinics, dealing with the welfare and care of babies, has been planned in the hope of maintaining their health, increasing their happiness, and decreasing the number of avoidable cases of infant mortality.

THE PREMATURE BABY.

Did you know that during 1929 853 babies under twelve months in age died in Queensland? Of these deaths that took place during the first year more than half occurred during the first month of life. A large number of these children were premature or else were feeble, weakly infants who should have received the same treatment as those who were premature.

If even half of the premature babies who are born each year in Queensland could survive, the much desired result would be a marked lowering of the infantile mortality rate. While most people know that when a baby is premature it needs special care and treatment, many have little knowledge of the special points which require immediate attention if the child is to have a reasonable chance of survival. Such babies when born in a locality where there is a baby clinic should be at once brought under the notice of the clinic nurse, who is always willing to advise the mother or to help her in carrying out the doctor's directions in the care of these cases. For the mother in the country where clinics and welfare nurses are not available the following directions may be useful:—

If a baby is under 5 lb. in weight when born it is better to treat it as premature to get satisfactory results. But even those who weigh so little as only 2 or 3 lb. can often live and develop into strong, healthy children if the necessary care be taken.

In appearance the premature differs from the normal baby in more than size. The little body is very soft and limp, the skin wrinkled, downy, and redder than usual. The infant is very weak and often too feeble to suck. The cry is feeble and suggestive of the mewing of a young kitten. Often the baby cannot cry at all.

There are four points which must receive immediate attention. They are— (*a*) Prevention of chilling (this is most important and must be the first consideration) (*b*) careful feeding with mother's milk; (*c*) careful avoidance of infection; and (*d*) avoidance of unnecessary handling .

Prevention of Chiling.

Because the baby has come too soon into the world it chills very quickly. A premature baby who is allowed to become thoroughly chilled soon after birth rarely lives. Therefore, when we know that an infant is to be born prematurely, special care should be taken to prevent this chilling. A small cot should be prepared, and by means of hot bottles thoroughly warmed. Baby must not be bathed nor even oiled at first. As soon as it is born wrap it in warmed cotton wool or soft flannel and place it in the warm cot. Six or eight hours later, if the child is then thoroughly warm, oil it with warm olive oil, using cotton wool swabs. Do this as quickly as possible, uncovering only a portion (say one arm or leg) at a time, and also taking care to move or handle the baby as little as you can. Very small babies should be oiled without being lifted from their cots, which should be screened from draughts while it is being done. In hospitals cots are specially prepared for such babies, but special cots are not essential, and a very satisfactory and comfortable bed for the "prem." can be quickly improvised. Half of an old-fashioned "dress basket" does splendidly, and failing this the family clothes basket or a box can be used. To prepare the improvised cot first line it with either brown paper or newspaper; this is to prevent the escape of heat. After this, and for the same reason, line the inside with blanket. A strip of old blanket or a wide woollen scarf can be used. To fix this place it first outside the basket so that it reaches from top edge to bottom, and fasten it securely either with a string tied all the way round or by sewing through the blanket and basket at intervals. Having done this turn the blanket over inside the basket so that

it is completely lined and also has a tidy top edge. Now throw a single blanket over the cot; it should not reach quite to the head of the basket. Place a thin firm pillow in the bottom and a soft one over it to form a mattress. A flannelette napkin will serve as a sheet, and a small folded fine towel as a pillow. At first a mackintosh may not be necessary, but later must be provided. Into this warmed cot baby is placed, wrapped in his cottonwool jacket, and covered with a soft shawl. Place a small light blanket over, letting it lie loosely on the child, and then draw the sides of the enveloping blanket across the cot and tuck them in. But this is not enough. Premature babies chill so easily that more warmth is required, and this is supplied by hot water bags or bottles. Rubber bags are best, but if they are not available stone gingerbeer or ink bottles will serve. In cold weather three are required—one at the foot and one at each side. One bag is placed between the two pillows at the foot of the bed; the others lie, not against baby's body, but tucked down at the side between the enveloping blanket and the mattress. For the bottle at the foot of the bed use two-thirds boiling water and one-third cold water; for the side bottles use equal parts cold and boiling water. These require to be refilled, one every hour in rotation, in winter. In summer two bags are usually sufficient once baby is thoroughly warm, and they do not need changing so often.

Give baby plenty of fresh air. Keep him in a well-ventilated room. In our Queensland climate the air, even in winter, is not cold enough to hurt the premature baby provided his bed is kept properly warm. Guard against overheating. It is wise to have a dairy thermometer in the bed, and this should register between 85 and 95 degrees Fahr. Gradually decrease the artificial heat as baby's strength improves. Oil him every second day, taking the same precautions as for the first oiling. Do not put him in the bath until he weighs 5 lb. As he improves commence with sponging, at first only face and hands, and gradually increase until he is being fully sponged, and later bathed.

Feeding is Very Important.

The healthy, normal baby thrives best if fed on his mother's milk. For the premature baby natural feeding is even more necessary; in fact, few survive without it. Though the baby may live and thrive on an artificial food, he is much more likely to do so if he is fed on his mother's milk, and failing this the milk of another healthy mother is the best thing. Sometimes a relative can be found who has a healthy baby of her own, and so is able to act as foster mother. It does not matter if the foster mother's baby is some months old; the milk will not hurt the premature baby on that account, though it may be necessary to dilute it perhaps to half strength at first. If there is any doubt as to the health of the foster mother until a test can be made, or the opinion of a doctor obtained, do not put the child to the breast, but feed from a spoon, and always boil the milk before it is given to the baby. If only a small amount of breast milk is available from either mother or foster mother give that first to the baby, and then make up to the full requirement with the artificial food. It will not do any harm to give the two foods in this way; in fact, the small quantity of mother's milk will help baby to digest the artificial food.

If breast milk is unprocurable, artificial feeding must be tried. Whey, which is easily digested, can be useful at first, and the child graded later to the following whey-milk mixture:—

Scalded milk, 2 oz. (4 tablespoonfuls);
Scalded whey, 2 oz. (4 tablespoonfuls);
Boiled water, 1 oz. (2 tablespoonfuls);
Sugar of milk, 2½ flat teaspoonfuls not pressed down;

or condensed milk can be tried, and if this is used a strength of one teaspoonful of condensed milk to twenty-four teaspoonfuls of water can be used to begin with. The condensed milk should always be poured from the container to the spoon in measuring. Very gradually, as the child improves, the strength can be increased to one teaspoonful of condensed milk to eight teaspoonfuls of water.

Nothing but boiled water should be given to the premature baby for the first twelve hours, but after that it must have food. It is impossible to say how much the child should have at a feed. Some of these infants are able to suck the breast and obtain all they need with three-hourly feeding. Others are quite unable to suck, and at first almost unable to swallow. Such cases must be fed with a pipette or eye-dropper, and if able to take only very little (perhaps only one or two teaspoonfuls) must be fed, at first, perhaps every hour with one interval, at night, of three hours. With a feeble baby it may take as long as half an hour to give it this small quantity. As soon as the baby can take a larger amount gradually increase the interval between the feeds (by a quarter of an hour at a time) to three hours, with one five-hour

interval at night. Also substitute a small feeding-bottle for the eye-dropper as soon as the child shows signs of sucking. While baby is too feeble to suck the breast the mother's milk must be expressed, either by hand or the breast pump, every three hours during the day, so that the supply may be kept up. As the child's strength increases it may be put to the breast, at first for five minutes twice daily, and the feeding finished from the bottle. A rough estimate of the amount of food that a premature baby should take is 3 oz. for each 1 lb. of body weight. Thus, if a baby weighs 3 lb., try to give him 9 oz. of food daily. So if he is fed nine times daily endeavour to give him 1 oz. each time. He may take much less at first.

Prevention of Infection.

As a result of being undeveloped and weak, baby is very susceptible to infection. Because he is so tiny he is generally an object of interest and curiosity to neighbours and friends who come to visit him. In his interest this should not be allowed. Even a common cold in and attendant or visitor can easily lead to a fatal pneumonia in a premature baby. For this reason isolate him as far as possible; have no unnecessary visitors and as few attendants as can be. If mother or nurse develops a cold she should tie a piece of gauze over her nose and mouth while attending to the child.

Avoidance of Handling.

Handling is very harmful to the feeble premature baby. Until he shows signs of increasing strength do not remove him from his cot while feeding or oiling him. Handle as little and as gently as possible while changing him. But change of position is necessary; turn him from one side to the other every four hours.

The care of a frail premature baby entails not only much care and trouble, but a high degree of skill. The successful rearing of such an infant is justly a source of pride to mother or nurse.

LADY STONEHAVEN'S MESSAGE.

Before leaving Brisbane on her homeward journey, Her Excellency, Lady Stonehaven, issued the following farewell message to the women of Australia:—

"The women of Australia have built up in the past great traditions and upheld noble ideals. They, equally with the men, were the pioneers in this great country. They lit the torch—and it remains with the women of to-day to keep the flame alive. The old noble traditions and ideals must be firmly upheld and maintained. The same spirit with which the women of Australia gave their husbands, brothers, and sons for the war animates the women of Australia to-day—the spirit to endure hardships and sorrows with a brave face, to overcome difficulties with a smile, to give up much, and to help their mankind to face adversities with bravery and perseverance. Patience and courage will be needed even more in the future, for the trials of peace make as great demands as do the stress and tribulation of war.

"I am quite confident that the women of Australia will respond to the call, and will uphold once more the honour of Australia, and win the respect of the world.

"It is an oft-repeated truism that we are facing hard times; but if those hard times are faced with courage and self-denial they will pass, and we shall all be better and happier for having overcome them. Having lived amongst the women of Australia for five years (and five very happy years) I am absolutely confident that their courage, patience, and real effort will carry them through these hard times. May I wish them, their husbands, brothers, and sons, from the bottom of my heart, God's blessing."

FLOWER GARDEN.

The flower garden will now be showing the result of the care bestowed upon it during the past two months. The principal work to be done this month is the raking and stirring of the beds, staking, shading, and watering. Annuals may be sown as directed for last month. Plant tuberose, crinum, ismene, amaryllis, pancratium, hermocallis, hippeastrum, dahlias, &c. Water seedlings well after planting, and shade for a few days. Roses should now be in full bloom. Keep free from aphis, and cut off all spent flowers. Get the lawn-mower out and keep the grass down. Hoe the borders well, and trim the grass edges.

THE ART OF ROSE CULTURE.

By G. H. HEERS (Department of Agriculture and Stock).

In a Lecture at the June Show of the Wynnum and Manly School of Arts Horticultural Society.

THE art of Rosiculture is romantic, full of disappointments and surprises, intermingled with wonderful discoveries which make it so fascinating.

I have great faith in Queensland generally, and, as a rose-growing country, I know of no place so favourably served from the point of climate and natural conditions. You may plant, bud, and flower a rose every day throughout the entire year. In what other country can this be done? In the matter of propagation, we can accomplish in a few months that which is most countries would take years to do. Hundreds of new varieties are raised annually in Great Britain, America, and other parts much less favourably situated, and actually imported to this country every year, instead of which we should be supplying the world's requirements in this direction.

In view of these facts, I propose to deal with the subject in a general way, yet keeping in mind any matter which would tend to instil in every rose enthusiast the desire for further knowledge of the rose, so that he may be encouraged to try his hand at raising new varieties, which after all is very simple.

In addition to the desirability of raising our own new sorts, this aspect of rose culture is undoubtedly the most fascinating of all its phases. Nature has provided the conditions, and all that is wanted is the will and the way. In order that you may more readily grasp the position, I propose to traverse very briefly the origin of the rose. This may not be popular with some of my listeners, but to build on a proper foundation it is necessary to show what things have already been achieved and how easy it will be to follow up this important work. It must be remembered that various species that will be briefly touched on cannot be compared with our present-day creations. Indeed, even at the present rate, it is difficult to foresee what standard of perfection will eventually be reached.

The Queen of Flowers.

The origin of the rose is somewhat conflicting. It is on record that even as far back as 600 B.C. Sappho sang—

"Would Jove appoint some flower to reign
In matchless beauty on the plain,
The Rose, mankind will all agree,
The Rose, The Queen of Flowers should be."

That position has never once been seriously disputed, and the rose still stands secure. From Homer to Tennyson and so on to-day, every poet, songster, and artist has always seized upon the rose in the embellishment of his art.

There are many species of wild roses, mostly originating in Asia, South and Central Europe, and North America. Although these are practically unknown in Queensland, in America sixty-eight species of wild roses are still catalogued. With these were produced the early Hybrids, Austrian Briar, Bengall, Rugosa, Sweetbriar, Damask, Cabbage, Multiflora, &c. One thing is certain—to-day's great ever-bloomers owe their existence to these wild flowers, plus, of course, man's handiwork.

English history shows that in the 14th century she had the "Wars of the Roses," when the combatants each chose a rose for their emblem, proving conclusively its popularity even in those days.

Some History.

In 1596, Austrian Copper, a highly coloured variety, was originated. Though this had always been admired for its colour and perfume, it was left for that noted French rosarian and hybridist, Pernet Ducher, to exploit this rose with a view to transmitting some of its richness and perfume into our modern roses. The result has been the creation of that wonderful strain of beautifully coloured roses known as "Pernetianas," so popular in most parts of the world, though unfortunately few of them thrive in this portion of Queensland. In 1778, a Cabbage rose (*Rosa Centifolia*) "Unique Blanche" was raised by Grimwood. Though there are early records of the Tea rose in India, Persia, and China, the date of its arrival in England is not clear, but it receives mention in 1810 and Hybrid Perpetuals in 1812. With these the work of hybridisation commenced in England, crossing and recrossing them with Hybrid China, Damask, Provence, and Bourbons. The Damask with its rich scent having been brought from the Orient by the Crusaders, its peculiar

fragrance is to-day still intact in such roses as Geo. Dickson, General McArthur, &c. The first record of the Hybrid Tea Class, a cross between the T. and H.P., so far as I am able to find, was when that quite good rose, "Adam," was originated in 1838. This rose, I might say, is still to be found growing well in the Brisbane Botanic Gardens, and also in Wynnum. Other notable early productions were Prince Camille de Rohan, H.P. in 1861, and La France, H.T. in 1867, both being still with us to-day. I forgot to mention that in 1820 Champney created the Noisette type by crossing T.'s with the China Musk. In 1878 what is known as Crimson Rambler was raised in Japan, its original name being "Shi Tz Mu" (meaning Seven Sisters). This rose was brought to England in 1890, and it is said that the great rosarian of the day, Charles Turner, made a fortune by disseminating it under the name of "Crimson Rambler," so that you will see that America is not the only country where that kind of thing has been done. Of course, the American never does things by halves. For instance, that well-known and very common rose, W. R. Smith, has now been sent out in that country under six different names, each description being an exaggeration on the previous one. Even some of our own people who should know better seem to think it sounds better to call F. K. Druschki, Snow Queen, and so on. No rosarian of any note would dream of such a thing, because he understands the circumstances under which they were named, and no individual is entitled to undermine such associations. Especially is this distasteful when after years of work, the raiser, no matter what his nationality, has bestowed an honour on someone near and dear to him. If you object to the name, be consistent and refuse to grow the rose.

The Work of the Plant Breeder.

Although the English hybridist has accomplished wonders, it is said that he has never set about breeding with any definite object, just crossing and recrossing any old way. The result has been that may English roses lack growth. However, it must not be overlooked that though these roses may not suit us in Australia, they may be quite good under pot culture. There are quite a number of hybridists in various parts of the world who have been breeding along defined lines, Pernet Ducher, Dr. Van Fleet, Peter Lambert, M. H. Walsh, and our own Alister Clark, of Glenara, Victoria, at whose wonderful home I had the pleasure of spending last Anzac Day, and oh, what a day! Mr. Clark is a gentleman who grows roses not for profit but for the love of them. He has growing many hundreds of distinct seedlings of his own raising, which when tested are usually sold for the benefit of some Horticultural or Rose Society. Mr. Clark has a firm conviction that by working crosses with "Gigantea," he hopes ultimately to produce a rose which will be proof against mildew. I was shown a gigantic plant of this species twenty-seven years old, stem 25 inches thick, and branches 36 feet long. Two or Mr. Clark's roses which are popular and doing well in Queensland are Sunny South and Blackboy. I believe that I have persuaded Mr. Clark to give us in future an opportunity of testing some of his fuller types of roses which fail to open in Victoria but which may prove suitable for our conditions. I believe Mr. Clark to be thoroughly Australian, and should the opportunity arise, I am sure Queensland will also benefit by his generosity. The other plant breeders mentioned have also made definite progress along given channels, each working on different types.

Climbers.

Altogether it is estimated that there are 12,500 varieties represented by the following types:—H.P., H.T., T., Bourbon, Polyantha, Wichuraiana, Banksia, Noisette, and the numerous climbing sports. In regard to these climbing sports, I would like to point out one aspect which is not well understood. After purchasing a climber it sometimes fails to climb and the nurseryman concerned is immediately assailed as having taken one down. Now this is often quite a wrong attitude, as no reliable propagator would think of working from anything but true climbing wood; and, further, would not send it out as a climber if it had not by then shown climbing form in the nursery. The trouble is few people understand that the original stem sent out by the nurseryman never becomes part of the future plant. This portion always dies and new growth coming from the impregnated portion near the base, which by the way may revert to the original dwarf, commences to bloom and forms the foundation of the tree to be. In proof of this theory, I ask you to look at any rose planted in your garden last year, when you will discover that that portion with the nurseryman's label attached is quite useless and should have long since been removed. For this reason, I favour a plant with only a single stem. In fact, if people only knew, the better plant is the one where the bud is still dormant, as then there is nothing to cut away, the process of which frequently causes disfigurement and even abnormal growths to form on the stem. The briar having been impregnated with the true climbing strain in the process of budding, it is possible by removing every portion of the dwarf growth to sometimes force it to produce the climbing

wood, though years may have elapsed since it was originally worked. Moving the plant to another location, sometimes automatically results in the change taking place.

The Rose in the Garden.

I am one of those who believe that the rose responds to man's sympathy. In fact, it has many peculiarities often found in the makeup of woman—always refined, attractive, and beautiful, appreciates attention and even admiration, in return for which it will give of its best. The rose is also mighty jealous and to a degree selfish. It resents the company of other flowers, wants your undivided attention and certainly excels wherever these conditions prevail. I always recommend that roses should be planted in a bed by themselves, this to occupy the premier position in the garden.

While roses will give good results under almost any condition, soils and their preparation and the natural situation mean much to their real success. I recommend trenching as a general rule, always being careful that the lowest portion of your bed will not act like a dam and hold water. On flat or ground that does not lend itself to trenching, it is better to raise the bed. In such event the earth should be enclosed with a wooden or concrete border. Roses should not be planted near the edges of raised beds, owing to the tendency of drying out.

The Troubles of the Novice.

Many thousands of roses are lost annually through misplaced kindness. I particularly refer to the general tendency of placing artificial fertilisers and fresh manures in the holes at the time of planting young roses. You would never think of giving a newly babe a beef steak. When thoroughly established the rose is a greedy feeder and will take almost any quantity of fertiliser or manure if properly rationed. I once heard a very eminent authority say that there were three things which you could not overfeed—the hog, the rose, and a man.

Colour and Scent.

It is estimated that there have been determined as many as 365 colour variations in roses. Perfumes also are surprisingly numerous and quaint. In 1886 the Horticultural Press of Philadelphia set out to identify perfumes, and in that year decided on Peach, Melon, Violets, Pinks, Raspberry, Hyacinth, and Apricot. Mr. H. R. Darlington and Rev. J. H. Pemberton, two noted English authorities, later added Russian Leather, Pear, Hay, Alcohol, Apple, Prune, Wine, Musk, Damask, Tea, and Fruit, and I think with the advent of the new white rose "Caledonia" out this year, I recognise yet another scent, that of Honey. Tea scent is mostly associated with lighter shades, Lady Hillingdon being an example, Damask in Geo. Dickson, General McArthur, and Radiance, whilst that of Fruit is very strongly found in Rev. F. Page Roberts.

Terms of form are expressed as Globular (Geo. Dickson), Flat (Malmaison), High centred (K. A. Viktoria and Mrs. Geo. Shawyer), Cup (Caroline Testout and Star of Queensland), Reflexed (J. J. L. Mock), also Imbricated, Ovoid, Cabbage, &c.

Types of Plants.

There is some confusion about types of plants, particularly regarding standards. True standards are seldom seen in Queensland, and I shall have more to say about this directly. (With the aid of specimen plants and a blackboard, Mr. Heers here explained the difference between a Standard which is worked some 3 feet or so from the ground on a briar stem, whilst Bush roses were those which were generally called dwarfs and which were worked—i.e., budded, on short stems, say, 4 to 5 inches from the root system, which when correctly planted would be level or just below the surface of the ground. Mr. Heers here showed a plant purchased at a department store which was budded on a stem about 10 inches long, and described it as useless, as there was no way in which such a plant could be correctly planted.)

Reverting again to the question of standards, it is the general belief that the sun is too hot in Brisbane for this class of rose. It is thought that the heat deleteriously affects the long exposed stem or trunk of the bush. If this were so, how is it that standards do particularly well in the central western portion of Queensland, where the sun is much hotter than in Brisbane It would appear that there are other reasons and, personally, I have seen excellent specimens here of strong growing types on "Rosa Odorata" and the weaker kinds quite good on "Fortunii." It is well known that standards from the South are worked on South Australian Dog Rose "Rosa Canina." This has a very shallow rooting system, which may have something to do with its unsuitability for Queensland. I am, therefore, of the opinion that a good deal has to do with the understock.

Whilst on the question of Understock, I might say that so far I favour "Rosa Odorata" for general use in Queensland. The same thing is used in the Southern States but is known under different names. In New South Wales it is called "American Noisette," Victoria "Maiden's Blush," South Australia "Boursault," and in Queensland it is also known as "Manetti." It was reported that at a lecture recently given at the Albert Hill, Brisbane, I favoured "Rosa Multiflora" as an understock. What I actually said was that in New South Wales this briar was becoming more and more popular and that some nurserymen were changing over to it entirely. I mentioned that it was undoubtedly an advantage to work Pernetianas on "Multiflora" and that in view of the fact that this blood was predominant in most of our newer roses, the time may come when we might have to seriously consider the advisability of also making the change. (Here Mr. Heers showed a number of understock in their various stages of preparation and growth from the naked cutting on to the young plant ready for planting out. With the aid of specimens the good and bad points were demonstrated, the speaker maintaining that the proper preparation of the cutting was important and unless the "heel" was so prepared to force an even callus, the rooting would not be symmetrical, upon which greatly depended the very foundation of a good plant.)

Failures Should be Negligible.

Provided that you have been supplied with the right class of plant and plant as directed at the right time, failures should be negligible, as the rose is hardy and easy to transplant. Failures can generally be attributed to one or more of the following causes:—Having used fresh manures or fertilisers at the time of planting, allowing roots to be exposed to the sun or wind, excessive wet weather, sodden ground, planting near shrubs, trees, hedges, and in shady positions, westerlies, heavy frosts, planting too shallow or too deep, or when placing the plant in the same position where a rose formerly grew without first replacing the entire soil, plants being knocked by children, dogs, or the careless gardener. The most common fault, however, is early planting. I have in and out of season preached the advantages of late-planting for Queensland, and can now definitely say that as a result quite a large number of growers who have followed my advice inform me that they have obtained wonderful results. It is inconceivable that in our climate, where roses are in full bloom and full of succulent growth as they are during the March, April, May, and early June period, the plant is in a fit state to lift. Then owing to the short intervals of warm weather during winter, which are certain in Queensland, the plants are encouraged to make premature growth which is cut down when frosty or westerly weather appears, as it assuredly does during our mid and late winter months. Remember if these same plants were left in the nursery undisturbed, they would not attempt to put forth growth, and in consequence if left till the winter is just about finished, the plants when transplanted simply jump away and never look back. I have thoroughly tested for the best time to plant, and as a result strongly recommend from August till the middle of September, and have no hesitation in stating that May and June, along with November, December, and January, are the very worst months of the year for planting roses in this country. I have always said that early planting may be quite alright in the Southern States, but very recently it was confided to me by leading authorities in both Victoria and New South Wales that the heavy losses occurring in those States in recent years are probably due to early planting. I am in possession of facts where already this year several lots of one dozen and more have completely gone west, due entirely to this stupid fad of early planting.

Pruning.

I take up the same attitude regarding pruning. August is in my opinion the best time to prune. Pruning is a difficult thing to give oral advice upon. If the blooms are always taken with long stems and any dead and spindled wood removed from day to day, the general overhaul is made comparatively easy. (By the use of the blackboard, Mr. Heers demonstrated some of the most important points. For instance, text-books always advised that the top eye should be pointing outward. This, he said, was quite correct for all tall and upright growers, but was all wrong when the spreading varieties such as Medea were being dealt with.)

Propagation.

In the propagation of roses there are two methods employed, that of cuttings and by budding. The latter, which is more generally used by nurserymen, was here explained in detail. Some varieties do quite well from cuttings, particulary on sandy soils but generally the briar lends vigour to the plant.

How New Varieties are Obtained.

There are two channels from which we get our new varieties. Sporting is one. By this I mean that for some unknown reason any rose may suddenly produce a rose quite distinct from its original. By working the stem which produces this freak, a new and distinct rose may be obtained. I am sure many hundreds of these sports go begging every year for the want of observance and knowledge. This strange phenomenon may be accounted for by the fact that these new types and/or colours may have been lying dormant for many years. This variation is undoubtedly due to the fact that these peculiarities were at some time associated with the parents' predecessors. Such things were also common regarding the human race. (Mr. Heers here, by the aid of prepared diagrams, described the process of cross hybridisation, taking for example several well-known roses, explaining that on the breeding alone F. K. Druschki may some day be expected to throw a pink sport.)

The second and more scientific method was the raising of varieties from seed. Nature has provided that the rose like all other forms of life must reproduce itself and spread over the earth. It bears small fruit containing seed. These the birds distribute far and wide. The rose itself is hermaphrodite, and is therefore subject to self-pollination. There are two methods of pollination, the first being where the pollen from the stamens (male) falls of its own accord upon its stigmas, and, secondly, cross-pollination where the pollen must be transferred from one distinct flower to another. To bring this about there must be some agent. The inanimate, wind and water, and the animate, birds, insects, &c. Here again for the latter, nature provides the necessary inducements in the rose by the production of sweet foods, scents, waxes, &c., in order that the bee or the bird may get some reward for the work performed. Any new sorts created in this way would be purely the result of chance. Having reached this stage and with the lessons that nature has provided, man is enabled to apply his knowledge in a more direct and scientific manner. As a result of his handiwork, enormous strides have been made in perfecting this most beautiful of all flowers. After describing what should be the aim of the hybridist when setting out on this work, including the care necessary in selecting the parents, Mr. Heers again effectively used black and white sketches to more clearly demonstrate the salient points. These included when and how to remove the petals from the "mother" bloom, then the stamens, pointing out that as this work had to be done prematurely so as to avoid interference, it is necessary to protect the stigma for about three days, when the pollen from the male parent should be carefully transmitted by the aid of a camel hair brush. Again, the pod should be covered with some light material like cheese cloth for at least ten days, when the cross will have taken. Make a record of the cross, and wait for the pod to ripen, when the seeds should be removed from the pod and planted. In the better growing months, those will grow very quickly. In the meantime have a few briars growing, and as soon as an eye shows on the seedling transfer this to the briar and with luck you may see the result of your labour within a month or six weeks, thanks to our wonderful natural conditions. As I said earlier, there will be many disappointments, but these are nothing compared with the reward which must sooner or later come the way of the experimentalist.

KITCHEN GARDEN.

Our notes for October will not vary much from those for September. Sowing may be made of most vegetables. We would not, however, advise the sowing of cauliflowers, as the hot season fast approaching will have a bad effect on their flowering. French beans, including butter beans, may be sown in all parts of the State. Lima and Madagascar beans should also be sown. Sow the dwarf Lima beans in rows 3 feet apart with 18 inches between the plants. The kitchen garden should be deeply dug, and the soil reduced to a fine tilth. Give the plants plenty of room, both in sowing and transplanting, otherwise the plants will be drawn and worthless. Thin out melon and cucumber plants. Spraying for fungoid diseases should be attended to, particularly all members of the *Cucurbitaceæ* and *Solanum* families, of which melons and tomatoes are representative examples. Give plenty of water and mulch tomatoes planted out last month. Asparagus beds will require plentiful watering and a good top-dressing of short manure. See our instructions in "Market Gardening," obtainable on application to the Under Secretary, Department of Agriculture and Stock. Rosella seeds may be sown this months. No farm should be without rosellas. They are easily grown, they bear heavily, they make an excellent preserve, and are infinitely preferable to the mulberry for puddings. The bark supplies a splendid tough fibre for tying up plants. The fruit also makes a delicious wine.

Orchard Notes for October.

THE COASTAL DISTRICTS.

October is frequently a dry month over the greater part of Queensland, consequently the advice that has been given in the notes for August and September regarding the necessity of thorough cultivation to retain moisture is again emphasised. Unless there is an adequate supply of moisture in the soil to meet the trees' requirements, the coming season's crop will be jeopardised, as the young fruit will fail to set.

Thorough cultivation of all orchards, vineyards, and plantations is therefore imperative if the weather is dry, as the soil must be kept in a state of perfect tilth, and no weeds of any kind must be allowed to grow, as they only act as pumps to draw out the moisture from the soil that is required by the trees or fruit-yielding plants. Should the trees show the slightest sign of the want of moisture, they should be given a thorough irrigation if there is any available means of doing so, as it is unwise to allow any fruit trees to suffer for want of water if there is a possibility of their being supplied. Intermittent growth, resulting from the tree or plant being well supplied with moisture at one time and starved at another, results in serious damage, as the vitality is lessened and the tree or plant is not so well able to ward off disease. A strong, healthy, vigorous tree is frequently able to resist disease, whereas when it has become debilitated through neglect, lack of moisture or plant food, it becomes an easy prey to many pests. If an irrigation is given, see that it is a good one and that the ground is soaked; a mere surface watering is often more or less injurious, as it is apt to encourage a false growth which will not last, and also to bring the feeding roots to the surface, where they are not required, as they only die out with a dry spell and are in the way of cultivation. Irrigation should always be followed by cultivation, so as prevent surface evaporation and thus retain the moisture in the soil.

All newly planted trees should be carefully attended to, and if they show the slightest sign of scale insects or other pests they should receive attention at once. All growth not necessary to form the future tree should be removed, such as any growths on the main stem or main branches that are not required, as if this is done now it will not only save work later on, but will tend to throw the whole strength of the tree into the production of those limbs that will form the permanent framework of the tree. In older trees all water sprouts or other similar unnecessary growths should be removed.

Keep a good lookout for scales hatching out, and treat them before they have become firmly established and are coated with their protective covering, as they are very easily killed in their early stages, and consequently much weaker sprays can be used. The best remedies to use for young scales hatching out are those that kill the insects by coming in contact with them, such as miscible oils, which can be applied at a strength of 1 part of oil in 40 parts of spraying material and will do more good than a winter spray of double the strength. In the use of miscible oils or kerosene emulsion, always follow the directions given for the use of those spraying materials, and never apply them to evergreen trees when they are showing signs of distress resulting from a lack of moisture in the soil, as they are then likely to injure the tree, whereas if the tree is in vigorous growth they will do no harm whatever.

All leaf-eating insects should be kept in check by the use of an arsenate of lead spray, taking care to apply it as soon as the damage appears, and not to wait till the crop is ruined. Crops, such as all kinds of cucurbitaceous plants, tomatoes, and potatoes are often seriously injured by these insects, and the loss occasioned thereby can be prevented by spraying in time. In the case of tomatoes and potatoes, a combined spray of Bordeaux or Burgundy mixture and arsenate of lead should be used, as it will serve the dual purpose of destroying leaf-eating insects and of protecting the plants from the attack of Irish blight.

Grape vines require careful attention, and, if not already sprayed with Bordeaux mixture, no time should be lost in applying this material, as the only reliable method of checking such disease as anthracnose or black spot and downy mildew is to protect the wood and foliage from the attack of these diseases by providing a spray covering that will destroy any spores that may come in contact with them. The planting of bananas and pineapples can be continued during this month. See that the land is properly prepared and that good healthy suckers only are used. Keep the plantations well worked, and allow no weed growth. Keep a very careful lookout for fruit flies; destroy every mature insect you can, and gather and destroy

every fallen fruit. If this is done systematically by all growers early in the season the subsequent crop of flies will be very materially decreased. See that all fruit sent to market during the month is carefully handled, properly graded, and well packed—not topped, but that the sample right through the case or lot is the same as that of the exposed surface.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

Much of the matter contained under the heading of "The Coastal Districts" applies equally to these parts of the State; for on the spring treatment that the orchard and vineyard receives the succeeding crop of fruit is very largely dependent. All orchards and vineyards must be kept in a state of perfect tilth, and no weed growth of any kind should be allowed. In the Western districts, irrigation should be given whenever necessary, but growers should not depend on irrigation alone, but should combine it with the thorough cultivation of the land so as to form and keep a fine soil mulch that will prevent surface evaporation.

All newly planted trees should be carefully looked after, and only permitted to grow the branches required to form the future tree. All others should be removed as soon as they make their appearance. If there is any sign of woolly aphis, peach aphis, or scale insects, or of any fungus diseases on the young trees, these diseases should be dealt with at once by the use of such remedies as black leaf forty, Bordeaux mixture, or a weak oil emulsion. In older trees, similar pests should be systematically fought, as if kept in check at the beginning of the season the crop of fruit will not suffer to any appreciable extent. Where brown rot has been present in previous years, two or more sprayings with Bordeaux mixture can be tried, as they will tend to check other fungus growths, but at the same time the sodium or potassium sulphide sprays are more effectual for this particular disease and should be used in preference when the fruit is nearly full grown. All pear, apple, and quince trees should be sprayed with arsenate of lead—first when the blossom is falling, and at intervals of about three weeks. Spraying for codlin moth is compulsory in the fruit district of Stanthorpe, and wherever pomaceous fruit is grown it must be attended to if this insect is to be kept in check.

In the warmer parts a careful check should be kept for any appearance of the fruit fly, and, should it be found, every effort should be made to trap the mature insect and to gather and destroy any affected fruit. If this is done, there is a good chance of saving the earlier ripening summer fruit, if not the bulk of the crop. Tomato and potato crops will require spraying with Bordeaux mixture, as also will grape vines. Keep a very strict watch on all grape vines, and, if they have not already been treated, don't delay a day in spraying if any sign of an oil spot, the first indication of downy mildew, appears on the top surface of the leaf. Spraying with Bordeaux mixture at once, and following the first spraying up with subsequent sprayings, if necessary, will save the crop, but if this is not done and the season is favourable for the development of the particular fungus causing this disease, growers can rest assured that their grape crop won't take long to harvest.

Where new vineyards have been planted, spraying is also very necessary, as if this is not done the young leaves and growth are apt to be so badly affected that the plant dies.

Farm Notes for October.

FIELD.—With the advent of warmer weather and the consequent increase in the soil temperature, weeds will make great headway if not checked; therefore, our advice for last month holds good wtth even greater force for the coming month. Earth up any crops which may require it, and keep the soil loose among them. Sow maize, cowpeas, sorghums, millet, panicums, pumpkins, melons, cucumbers, marrows. Plant sweet potatoes, yams, peanuts, arrowroot, turmeric, chicory, and ginger. Coffee plants may be planted out. There are voluminous articles in previous journals giving full instructions how to manage coffee plants from preparing the ground to harvesting the crop, to which our readers are referred.

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY D. EGLINTON, F.R.A.S., AND A. C. EGLINTON.

TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

Date.	September, 1930. Rises.	September, 1930. Sets.	October, 1930. Rises.	October, 1930. Sets.	MOONRISE. Sept., 1930. Rises.	MOONRISE. Oct. 1930. Rises
1	6.10	5.34	5.36	5.48	a.m. 11 29	p.m. 12.1
2	6.9	5.34	5.35	5.48	p.m. 12.21	12.58
3	6.8	5.35	5.34	5.49	1.14	1.52
4	6.7	5.35	5.33	5.50	2.8	2.45
5	6.6	5.36	5 32	5.50	3.5	3.39
6	6.5	5 36	5.31	5.51	4.0	4.33
7	6.4	5.37	5.29	5.51	4.53	5.25
8	6.3	5.37	5.28	5.52	5.47	6.21
9	6.2	5 38	5 27	5.52	6 39	7 18
10	6 0	5 38	5.26	5.53	7.31	8.16
11	5.59	5.39	5 25	5 53	8.25	9.17
12	5.58	5.39	5.24	5.54	9.21	10.19
13	5.56	5.40	5.23	5.54	10.22	11.19
14	5.55	5.40	5.22	5.55	11.23	...
15	5.54	5.41	5.21	5.55	...	a.m. 12.20
16	5.53	5.41	5.20	5.56	a.m. 12.25	1.15
17	5.52	5.42	5.19	5.56	1.27	2.7
18	5.51	5.42	5.18	5.57	2.28	2.49
19	5.50	5.43	5.17	5.58	3.24	3.26
20	5.48	5.43	5.16	5.58	4.12	4.0
21	5.47	5.43	5.15	5.59	4.53	4.35
22	5.46	5.43	5.14	5.59	5.30	5.9
23	5.45	5.44	5.13	6.0	6.9	5.46
24	5.44	5.44	5.12	6.1	6.40	6.25
25	5.43	5.45	5.12	6.1	7.14	7.10
26	5.42	5.45	5.11	6.2	7.53	8.2
27	5.40	5.46	5.10	6.3	8.34	8.56
28	5.39	5.46	5.9	6.3	9.21	9.52
29	5.38	5.47	5.8	6.4	10.16	10.46
30	5.37	5.47	5.7	6.5	11.7	11.44
31	...	...	5.6	6.6	...	12.40

Phases of the Moon, Occultations, &c.

8 Sept.	○	Full Moon	12 47 p.m.
16 „	☽	Last Quarter	7 12 a.m.
22 „	●	New Moon	9 41 p.m.
30 „	☾	First Quarter	12 57 a.m.

Apogee, 6th September, at 7.54 a.m.
Perigee, 21st September, at 2.54 p.m.

It will be interesting to notice the apparent nearness of the planets Mars and Jupiter to one another between 2 and 5 a.m. near the end of the month. Mars will pass from west to east of Jupiter on the 27th. They will appear to be in the constellation Gemini, about 10 degrees southward of Castor and Pollux. The position of the newly discovered 9th Planet is now charted as very near this position of Mars and Jupiter.

Mercury will set at 7.33 p.m. on 1st September; on the 15th it will set at 6.40 p.m.

Venus will set at 9.11 p.m. on the 1st and at 9.16 p.m. on the 15th.

Mars will rise at 2.15 a.m. on the 1st and at 1.57 a.m. on the 15th.

Jupiter will rise at 3.0 a.m. on the 1st and at 2.14 a.m. on the 15th.

Saturn will rise at 12.43 a.m. and set at 2.27 a.m. on the 1st; on the 15th it will rise at 11.45 a.m. and set at 1.32 a.m.

The Southern Cross will reach the western side of the circle in the sky, which it describes daily, about 8 p.m. at the beginning of the month, and about 6 p.m. at the end. It will be noticeably far away to the right (60 degrees) of the position it occupied 6 months ago. The same distance (60 degrees) lies between its position when erect and that when reversed and below the southern horizon in Queensland.

8 Oct.	○	Full Moon	4 56 a.m.
15 „	☽	Last Quarter	3 12 p.m.
22 „	●	New Moon	7 48 a.m.
29 „	☾	First Quarter	7 22 p.m.

Apogee, 3rd October, at 6.54 p.m.
Perigee, 19th October, at 5.42 p.m.
Apogee, 31st October, at 12.18 p.m.

The Moon will be partially eclipsed between 4.46 a.m. and 5.27 a.m. on 8th October. It will also cause an eclipse of the Sun on the 22nd between 6.18 a.m. and 7.40 a.m. At 7 o'clock the Moon will cover one-quarter of the Sun's disc.

Mercury will be at its greatest elongation, 18 degrees west, on 7th October.

Remarkably few of the usual phenomena will be visible in Queensland during this month, such as conjunction of planets with the Moon.

On the 15th Jupiter will be passed by the Moon at 11 a.m., and Mars 14 hours later.

Neptune will be passed on the 18th at 3 p.m.; Mercury also in daylight on the 21st at noon. Venus will be passed on the 25th at 1 a.m. when below the horizon, and Saturn on the 27th at 11 a.m.

Mercury will rise at 4.39 a.m. on the 1st, and at 4.45 a.m. on the 15th.

Venus will set at 8.20 p.m. on the 1st, and at 8.11 p.m. on the 15th.

Mars will rise at 1.33 a.m. on the 1st and at 1.8 a.m. on the 15th.

For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S., add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhat about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

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QUEENSLAND AGRICULTURAL JOURNAL

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Event and Comment.

The Current Issue.

ANOTHER instalment of his story of the Queensland sugar industry is contributed by Mr. Easterby, in which he brings his narrative up to 1921 and gives an account of the inquiry, instituted in the following year, into suitable sites for future mills. The third part of Mr. Currie's paper on the Brown Cutworm is another valuable contribution. Mr. Carew has the first article of a series on farmers' sheep and wool, planned for the purpose of supplying some of the information sought from time to time by readers interested in sheep and wool; and also with the hope of stimulating further interest in sheep raising on comparatively small holdings. Tobacco growing in North Queensland, is the subject of an important announcement by the Minister for Agriculture and Stock, Mr. Harry F. Walker; and this is supported by notes on how to establish tobacco seed beds by Mr. Pollock, who also has a timely article on bright tobacco cultivation in the North, in which he gives some particulars of producing districts and of tests made on leaf grown since 1928. Mr. Munro has compiled a useful summary of breeding and feeding points relating to Angora rabbit keeping, as well as of the regulations prescribed for its proper control. Mr. Edmund Jarvis has his customary seasonal hints on entomology for canegrowers, and other sugar pages are well supplied. An excellent camera record of dairy cattle prize winners at the recent Brisbane Royal Show is also presented. General working notes cover a wide field in which farmers will find a fund of useful information.

The Price of a White Australia.

A RECENT "Times" message from Melbourne on the political activity of opponents of the renewal of the sugar agreement has aroused considerable interest in oversea sugar circles. It is recognised there that the embargo is a measure of protection which these in the northern half of Australia realise to be

a necessity, and therefore inevitable. It is also known that the embargo is the source of perpetual grumbling on the part of the much larger population inhabiting the southern half, hence their political activity as the time for renewal of the agreement approaches. The "Times" cable stated the opponents are claiming that the prohibition of foreign sugar costs the taxpayers five and a-half millions a year, and even the highly protectionist paper, "The Age," protests against this "outrage of legalised banditry as an act of definite hostility to the people," and asks only for a protective duty against imported sugar produced by cheap labour. This strong language is some indication of the bitter feeling that is being worked up in the South against the price that has to be paid for sugar produced in one corner of the continent. As has been pointed out so frequently, Queensland is not the only State that benefits materially from the sugar industry. Every State has its refinery, and every State otherwise shares in its wages, profits, and national benefits.

Commenting on the "Times" telegram, the "International Sugar Journal," a recognised authority on the cultural and technical sides of the industry, has this to say on the Southern agitation:—

> But it may be said with justice that these Australians cannot have their cake and eat it. Several decades ago, for good or ill, they decided to banish the coloured or kanaka labour from their canefields, this being part of their deliberate policy of keeping Australia "white." They ignored the fact that practically everywhere else in the tropics and semi-tropics the main labour of the canefields is coloured, and receives the pay of coloured labour. Queensland was purged of its cheap labour; white labour at trade union rates of pay (always high in Australia) steadily took its place and carried out the job of sugar production—at a price. But the world price of sugar is necessarily lower and has been markedly so the last few years, and but for the embargo on foreign sugar Australia would have proved a convenient dumping ground for the world's excess of sugar, as a consequence of which the Queensland sugar industry would have found its product unsaleable. Nor would things be better if there was, as suggested, merely a duty against sugar produced by cheap labour, for who nowadays is to decide whether sugar comes in that class or not, when the ruling world's price is lower than one at which most producers employing cheap labour can be said to make a profit at all. It seems clear to most onlookers that so long as Australia wishes to produce her own sugar and do so with white labour the price must be paid. This price is paid, *inter alia,* in consummation of a national policy of keeping the Northern Queensland littoral populated with whites, as a racial barrier against the oriental peoples living to the north of Australia. It is doubtful whether there is any other industry alternative to sugar that would suit the Queensland climate. Sugar, then, is so bound up with State policy that it is hard to conceive the Commonwealth Government making any radical change in the system at present in force. Unfortunately, there have not been wanting indications of late years that Commonwealth policy is apt to clash with the interests of individual States, and *vice versâ.* The larger part of the Australian population lives so remote from the Queensland canefields that it is conceivable that they may, through their State Legislatures, force the Commonwealth Government to modify the assistance granted to the sugar-producers. Time will show how far the opposition has gained force since the last agreement was signed. Those who see a future for Empire sugar in supplying the needs of the United Kingdom will regret it if, on the possible eve of the venture, the Australian sugar industry is launched on a sea of troubles owing to dissention within its borders.

Tobacco Growing in the North.

THE attractive scheme adopted by the Government to stimulate tobacco production in North Queensland by opening for early selection an area of Crown land in the Mareeba district, comprising twenty-five portions specially selected for tobacco production, with due regard to quality of soil, water supply, and ease of access, under certain conditions, cannot but be regarded as the praiseworthy result of careful and lengthy consideration on the part of those responsible. The production of a crop of 5 acres on each of the twenty-five farms, which will mean 125 acres under tobacco this coming season, with a probable yield of 30 tons of cured leaf, carrying a value of approximately £9,000, will be a comparatively small set off against the total quantity at present brought annually into this country, and may be regarded as the beginning of a rapid decline in imports and consequent obviation of the necessity of our continuing to send so much of Australia's gold overseas in payment for them. The profitable return, which may reasonably be expected to

follow the investment made by the successful growers, will no doubt stimulate a rapid settlement of land suitable for tobacco cultivation, which exists in considerable areas in the North. The use of local available labour in grubbing and clearing to allow of 5 acres being cropped on each farm this coming season is also commendable. The cost, not exceeding £12, for grubbing, clearing, and ploughing each acre, must be regarded as a moderate charge in the class of country which it is proposed to bring into production, and one that will meet with the approval of the selector. Reproductive work of this nature, particularly at a time like the present, is most desirable, not only in respect of its promotion of settlement, but also in its relation to the general wealth and progress of the State.

The Passing of Ernest Baynes.

THE primary industries of Queensland sustained another great loss by the death of Mr. Ernest Baynes, President of the Royal National Association, on 22nd September. His passing is deeply deplored by all associated with country life and work, as well as by citizens generally. At every Brisbane show for nearly forty years he was a notable figure, and the Royal National Association, of which he was an active member for thirty-eight years, owes much to his strong and unfailing advocacy of everything that made for the advancement of rural enterprise in this State. To him always nothing short of the best possible was good enough, and he certainly gave of the best of his own great ability to Queensland. In later years, having retired from a successful commercial career, he devoted his time to the Royal National Association as an active and enthusiastic promoter of its interests and as a shrewd director of its great influence in developing the resources of the State. He watched the association grow from its infancy to its present full stature as a sturdy figure and beneficial force in our national life. The high regard of his co-workers as their president was due to his long service to the association. For many years he was ringmaster at every Brisbane show, and relinquished that post to become chairman in 1920. In 1923 he was appointed acting president, and on the death of Mr. C. E. McDougall in 1924 he became president, a position he had occupied ever since. He was a great judge of live stock, especially horses, and was a member of the Stallion Board of Queensland.

The late Mr. Baynes was born in South Brisbane in 1864, and spent his childhood there. His early education was entrusted to the late Major A. J. Boyd, F.R.G.S., who later occupied the editorial chair of this journal for twenty-four years, and his secondary training was received in Horton College, Tasmania, and in the Grammar school, Toowoomba. On leaving school Mr. Baynes worked in various capacities on Queensland stations, and spent some years droving in the far West and in the North. Later he went to Western Australia to assist the Durack pioneers in establishing their cattle station in the Kimberley district. Subsequently he was one of a party sent out by Sir Thomas McIlwraith to investigate the possibilities of sugar-growing in the Western State. On his return to Queensland he joined his brothers in the business of the Graziers' Butchering and Meat Export Company, subsequently known as Baynes Brothers, who held properties on the Burnett and on the Darling Downs. Not only in Queensland but in the Southern States Mr. Baynes enjoyed a deservedly high reputation as a judge of live stock. As a judge of horses his services were always in request. He represented the association on many occasions at all the big shows in Australia, and has adjudicated at Melbourne, Sydney, and Adelaide. He owned many famous ring champions, including Comet, a champion buggy horse of Australia, and Spondulix, the great high jumper. For many years he served as honorary judge of the Queensland Turf Club, and was a member of that body for some time, and was a very popular and prominent participator for many seasons. He was also one of the founders of the Queensland Ambulance Transport Brigade. It was, however, as president of the Brisbane show that he was best known, and the "Brisbane Courier" in the course of a graceful and fitting tribute remarked:—"For that position the late Mr. Baynes was splendidly fitted, because he had an unusually wide knowledge of the primary and secondary industries of Queensland; he was a lover of good stock; he had a very sincere sympathy with the producer; and he was gifted with an engaging manner that helped to smooth away difficulties. In a masterful way Mr. Baynes performed a really great service for the Royal National Association, and incidentally for the State. He was essentially a worker, always anxious to help his association and his country, and he realised very fully the great importance to Queensland of the primary industries. His loss to Queensland will be considerable; to the Royal National Association it will be very great, because it will not be an easy matter to combine in one man the wide knowledge, the keen enthusiasm, and the genial manner of the late Mr. Ernest Baynes."

THE QUEENSLAND SUGAR INDUSTRY.

By H. T. EASTERBY, Director, Bureau of Sugar Experiment Stations.

PART X.

(b) Review of the Industry since Federation

(*Continued*).

THE last section of this history finished with the year 1921. In the following year the Government of the day decided to appoint a Royal Commission to inquire into the most suitable locations for sugar-mills which might be erected in the near future. This Commission, consisting of Mr. W. Harris, P.M., Chairman, and Messrs. Easterby and Salisbury, as members, commenced its investigations in October of that year. The localities in respect to which representations had been made to the Treasury as being probable or possible locations for the erection of new sugar-mills were as under:—

1. Cooktown.
2. Bailey Creek and Daintree River.
3. Atherton Tableland.
4. Liverpool Creek and Maria Creek.
5. Tully River and Banyan.
6. Ingham (Long Pocket and other lands).
7. Lower Burdekin district (Inkerman lands).
8. Bowen.
9. Mackay (Silent Grove, St. Helens, &c.).
10. Rockhampton district.
11. Goodnight Scrub (Bundaberg district).
12. Gayndah (Binjour Plateau and Reid's Creek).
13. Gympie (Goomboorian).
14. Yandina.
15. Buderim.
16. Miscellaneous (Peter Botte, Bloomfield, Lockhart, and Gilbert River).

This was a pretty formidable list, larger even than that which the two previous Commissions had to deal with.

Between 10th October and 13th December the Commission visited all the localities suggested, except those in No. 16.

Their report was made on the 30th December, 1922, and states that after carefully considering the evidence available with respect to each locality reported on, it was affirmed unhesitatingly that the most suitable location for a sugar-mill to be erected in the near future was undoubtedly in the Tully-Banyan area. In that locality the Commission considered there was room for a mill of a capacity at least equalling the South Johnstone Mill.

Two other sites were selected provisionally, viz.:—

(*a*) Bailey Creek and Daintree, conditionally on its being ascertained by a sufficient survey that satisfactory tramway connection at a reasonable cost could be made from Bailey Creek with the Daintree River lands beyond Thornton Range.

(*b*) Inkerman (Home Hill), if it is found that the increase in the production of cane in the Inkerman irrgation area and other lands in the vicinity became so great as to be beyond the crushing capacity available, and that crops other than sugar-cane could not be successfully raised.

A thorough and exhaustive inspection was made of the Tully lands; scrubs were traversed and mill and wharf sites inspected, while a great deal of evidence was taken in connection with these and other matters affecting the project. The mill site then selected by the Commission (Smyth's) was the one ultimately chosen for the erection of the Tully Mill.

As the outcome of the Commission's report the Government decided to at once proceed with the erection of the Tully Mill.

As this was the last Commission up to the present to sit on the subject of Central Mills, it may be of interest to refer to sites that were not visited, and of which little is yet known. At the present time there is small chance of these lands being required in the near future for sugar cultivation; but in the course of time, when the present lands can no longer provide for Australian consumption, attention will be drawn to the possibility of opening up new areas.

Good country was mentioned to the Commission as existing near Mount Peter Botte, which is situate between Port Douglas and Cooktown. These lands lie approximately between Peter Botte and the China Camp Diggings, and are surrounded by ranges 2,200 feet high, which have to be crossed to provide access. The area of cane land is estimated approximately at 20,000 acres, and is compact and fairly level; the soil is of good quality, alluvial, and covered with tropical jungle. The general trend of the country is along Roaring Meg River.

The Bloomfield lands were also spoken of, but these are of limited area, as far as good cane areas are concerned. Some of them were cultivated many years ago, but were abandoned. This district also suffers from difficulty of access.

The Lockhart country on the eastern side of the Peninsula was also brought under notice, but no information could be obtained as to this area.

The Gilbert River lands in the west of the Peninsula were stated to be suitable for canegrowing with irrigation, and it was considered that these lands possessed better soil than the Lower Burdekin district.

The small rainfall in these two lastmentioned localities, and the difficulty of access to market, may militate against their success as canegrowing districts, although the former disadvantage might perhaps be overcome by irrigation. It will be many years, however, before it will become necessary to search for new cane areas, and there may be other localities that would be suitable as well.

Continuing with the year 1922: This season opened up splendidly, and the sugar yield was the best since 1917—viz., 287,785 tons of 94 net titre sugar; but for a falling off in rainfall during the latter part of the year it would have been much higher.

The 1922 season was the last one covered by the Agreement between the Commonwealth and State Governments, which was made in 1920 for three years, providing for the payment of £30 6s. 8d. per ton for raw sugar. This Agreement was not renewed, and a protective duty of £11 6s. 8d. was asked for, but not granted. A duty of £9 6s. 8d. was fixed, which was felt to be disappointing.

The Commonwealth Government, however, was anxious to decontrol those industries (including sugar) which they had been handling in the

war period, and although the industry put up a strong fight for the £30 6s. 8d. Agreement the Commonwealth finally decided that they would grant an embargo against the entry of black-grown sugar into Australia up till 30th June, 1925, the industry to form a pool free from Commonwealth control to buy raw sugar for the 1923 season at £27 per ton of 94 net titre sugar f.o.b. mill. The price for the 1924 season to be determined after investigation by a tribunal, but not to exceed £27 per ton.

Another dry period was experienced in 1923, which was especially felt in the districts below Townsville. The Maryborough, Isis, Bundaberg, Mackay, and Lower Burdekin areas harvested poor crops. This low yield was compensated for by the excellent crops in all districts above Townsville. Although it was one of the driest years experienced, the yield of cane and sugar per acre in the far North was high. This bears out the general impression that dry years in the wetter districts of the North, such as Innisfail and Babinda, usually produce much better crops than do very wet seasons. No real droughts have ever occurred in Innisfail and Babinda, where the rainfall (though only about half the average in 1923) reached 78 and 94 inches respectively from 1st January to the end of October. The sugar crop for this year was 269,175 tons.

A tender for the erection of the Tully Mill was let this year to Walkers Limited, of Maryborough, the construction work being in the hands of Messrs. Barbat and Sons, of Ipswich. The clearing of the land for the mill site was commenced, and preparation made for the erection of the mill buildngs. Farmers, too, that year were busy clearing their holdings and getting in cane, and there was, even at that time, a considerable population and four stores.

An important event took place in December of this year when the through line from Brisbane to Townsville was opened, which again opened up new country, particularly north of Mackay as far up as Bloomsbury.

In January, 1924, a tribunal appointed by the Commonwealth and State Governments, as provided for in the Agreement of 1922, made investigations into the industry. The basis of the inquiry was to be the cost of efficient production in reasonably good districts, and under normal conditions, and the price fixed was not to exceed £27 per ton. This tribunal, after careful investigation, concluded that the price of £27 per ton for raw sugar was fair and reasonable.

Following on perhaps the severest drought experienced in many of the sugar areas, 1924 proved an excellent season. The drought persisted into January, but after that the rains were plentiful and well distributed, and the crop was a record one, the yield of sugar being 409,136 tons, of which it was necessary to export 74,000 tons overseas. This was the commencing year of the export trade in sugar, which has continued ever since.

During this year Messrs. Bennett, Bell, and Kerr were sent abroad to receive special training in the sugar industry, in sugar-mill technology, sugar-cane diseases, and soil physics and chemistry, respectively.

The erection of the Tully Mill was proceeding this year, and tramway work and bridge building was going on rapidly. A large area of

scrub had been fallen, and numerous business places were established. A temporary school with about seventy-eight children on the roll was also opened.

In 1924 the last link of the main line from Brisbane to Cairns was completed by the placing in position of the last span of the Daradgee Bridge, over the Johnstone River, and in December passengers were able to travel by rail from Brisbane to Cairns.

The Babinda Mill was this year taken over from the Government by the farmers concerned.

In April, 1925, a conference of those interested in the milling and growing of cane was called by the Minister of Agriculture, when the position as to surplus sugar was carefully reviewed. It was then determined that the whole of the season's crop of cane should be harvested, and that the making of the necessary arrangements as to the marketing, &c., should be left in the hands of the Sugar Board.

During this year (1925) the embargo was extended for three years as from the 31st August, 1925, under certain conditions as to prices and concessions to manufacturers.

A Royal Commission in the person of Mr. T. A. Ferry, who was then Under Secretary to the Chief Secretary's Department, was appointed to inquire into and report on the social and economic effect of the increase in number of aliens in North Queensland. This will be dealt with in a subsequent section.

Later in the year trouble arose with the export sugar through an unfortunate dispute on British ships. In consequence, large quantities of sugar remained in mill stores, and some of the mills had to erect increased storage accommodation to meet the situation.

Industrial unrest on interstate vessels and the railways also affected the industry, and some of the mills had to close down for a period, thus extending the crushings into less satisfactory months of the year. A rotary strike of wharf labourers at Cairns and Innisfail had the effect of holding up for some time the transport of sugar to Australian refineries.

Proposals for the erection of a distillery at Plane Creek were made this year to utilise molasses and cassava for the purpose of manufacturing power alcohol.

The yield of sugar this season was particularly good, being 485,585 tons—the record to date. This meant a big export which reached 211,000 tons. This large surplus having to be sold overseas at world's prices caused considerable loss, and gave rise to much discussion. Many schemes were brought forward with the view of alleviating the trouble, including proposals for the allocation of quotas to the various mills. The principal reason for the surplus sugar, however, was the large increase in the area devoted to canegrowing, and also in the number of canegrowers. This was in a great measure due to the opening up of new lands by the North Coast Railway to Cairns. In 1920 the area cultivated amounted to 162,619 acres, the number of canegrowers being 3,930, while in 1925 the area under cane was 269,509 acres, an increase of 106,890 or 65 per cent., and the number of growers of cane of 5 acres and over was 6,730 or 2,800 more than in 1920, an increase of 70 per cent.

Plate 106.—Central Sugar Mill, Tully.

The largest sugar-mill in Australia—viz., the Tully—was completed this year with a short crushing, which did not commence till November, so that the operations were more in the nature of a trial run.

By this time much settlement had taken place in the Tully area, due to the opening of the mill and the completion of the railway to Cairns. What had been an inaccessible unpopulated belt of jungle two or three years previously was now carrying an ever-increasing settlement of farmers and business people, who were speedily opening up roads and establishing cane farms and a township with all the modern adjuncts of civilisation.

In the following year, 1926, the crop was considerably affected by dry weather conditions, in those districts south of Townsville more especially. A most unusual occurrence this year was the large amount of damage done by frosts on the Herbert River. Frosts also caused losses in Mackay and in the more southern sugar areas.

The Queensland Cane Growers' Council was created this year by Act of Parliament, entitled "*The Primary Producers' Organisation and Marketing Act of* 1926," which provided that for the sugar industry there should be constituted—

(*a*) Mill Suppliers' Committees,
(*b*) District Canegrowers' Executives,
(*c*) The Queensland Cane Growers' Council.

These bodies were to manage the affairs of the sugar industry generally, and the Cane Growers' Council was authorised to convene an Annual Sugar Industry Conference, while special conferences might be convened by the Council on matters of urgent business as the said Council might deem desirable, also to raise levies to be expended for the benefit of the industry generally or locally.

The power alcohol industry in Queensland was also initiated this year by the erection of a factory and distillation plant at the Plane Creek mill, Mackay. At the outset it was proposed to utilise molasses together with a starch-bearing plant known as cassava, of which about 100 acres had been planted around Plane Creek. The distillation from cassava roots, however, was subsequently abandoned. At the time it was estimated that a ton of molasses would yield some 65 gallons of power alcohol. The factory did not commence operations till the following year. The estimated cost of erection at that time was about £35,000.

The Farleigh mill, which had been owned by a private firm, was taken over by the farmers this season.

The sugar yield in 1926 was almost 100,000 tons below that of 1925, only amounting to 389,272 tons. In consequence the export was much lower—viz., 74,777 tons, as compared with 211,000 tons in 1925.

During the following year (1927) consideration was given by the Central Cane Prices Board to cane assignments, and the secretary visited a number of districts for the purpose of collecting information to enable the Board to determine the areas to be assigned to growers.

This year a co-operative association of farmers took over the South Johnstone Sugar Mill from the Government, and this led to great industrial turmoil at the mill, lasting from May till September. During this strike much bitterness was engendered, a picket was shot, stone-throwing and assaults were common, and finally the railways became

involved, which led to the dismissal of practically the whole staff and their re-engagement a few days later. Finally the strike was settled, though the farmers had to work the mill at first with one shift, and afterwards with two shifts; also volunteer labour was engaged for a time. The mill, however, was unable to crush all the cane due to loss of time, and the tonnage was reduced from about 207,000 to 155,000.

The power alcohol distillery at Plane Creek was opened this year, but met with manufacturing difficulties, and further additions were necessary.

The 1927 season was, on the whole, favourable to growth, though a cyclone at Cairns and disastrous floods at Innisfail and Ingham caused considerable loss. The worst feature of the Ingham floods, however, was the heavy loss of life by drowning fatalities, which tragedies will remain in the memories of many people for years to come. The loss of cane in the northern areas affected by the cyclone and floods was estimated at the time to be about 120,000 tons.

Frosts did considerable damage in the Moreton area this year, and to some extent also at Bundaberg. Mackay had a very fine crop, amounting to upwards of 101,000 tons of 94 net titre sugar.

The yield for the State was 485,745 tons of 94 net titre sugar; this was somewhat higher than in 1925, and constituted the record to date. The export sugar was 152,384 tons.

In 1928 the Agreement between the Commonwealth and State Governments for continuance of sugar prices and the maintenance of the embargo was renewed for another three years, the Federal Government reserving the right to revise Australian prices if increased preference was granted to export sugar from Australia by Great Britain or any Dominion. The subject of this preference has not yet been alluded to, but will be dealt with in the section on prices later on.

The 1928 season was wet in all sugar districts in the earlier part of the year, and excessively wet in the South. The rains were followed by a long period of dry weather, which induced an early arrowing of the crop, more particularly from Mackay north. Serious floods, cyclones, and frosts were not experienced, and labour worked steadily and well throughout the year. Some waterside trouble, however, was present, and difficulties with storage accommodation were in evidence, and many farmers had to come to the rescue and load and even man small sugar vessels in order to get their sugar away.

The commercial cane sugar in the cane was high this year, and the output constituted the largest tonnage of sugar ever manufactured in Queensland—viz., 520,620 tons of 94 net titre sugar. The tons of cane required to make one ton of sugar that season were the lowest up to that time—viz., 7·18. The export of sugar was 186,703 tons.

In 1929 the crop was not so large due to frosts in the southern areas, long continued dry weather in some places, and considerable grub damage in northern sugar localities. The sugar made reached a total of 518,516 tons of 94 net titre sugar, while the tons of cane required to make one ton of sugar was even below that of 1928, being 6·91. The commercial cane sugar in the cane was remarkably high in 1929.

Having brought this history up to 1929 in a general way, it is proposed to deal with mills and mill work in the next article.

[TO BE CONTINUED.]

Bureau of Sugar Experiment Stations.

ENTOMOLOGICAL HINTS TO CANEGROWERS.

By EDMUND JARVIS.

Always Select Good Seed Cane for Planting.

The importance of careful seed selection cannot be over-estimated, this being one of those common-sense methods which is bound to yield favourable results. Nature never makes a mistake. Throughout both the animal and vegetable world one finds an unalterable law to the effect that "like produces like"; in other words, we shall always reap the same kind of thing that we sow. What would you think of an orchardist who, when propagating young apples or peaches, was to carelessly take the buds from unhealthy trees or from those which he knew bore fruit of inferior quality?

Do not forget that it is quite possible for any canegrower to thoughtlessly introduce into a clean plantation insects or fungus diseases which in the course of a few years will inevitably reduce his yield of cane very materially. When planting, reject any sets showing tunnels of the weevil borer at the cut ends. Do not obtain same, if you can avoid doing so, from a plantation or even from a locality known to be borer-infested. Such seed often harbours young larvæ of this beetle, which later on may so riddle a set as to make it useless for support of the young cane, thus causing unsightly misses. In the Burdekin district care must be taken to select seed which is free from tunnels of the "Giant Termite." When using top plants of Badila or other soft varieties a lookout should be kept for the presence of moth borers, external indications of which are betrayed by surface tunnels more or less blocked by webbing covered by pellets of excreta.

Entomological Work should Interest Canegrowers.

I would again emphasise the fact that more interest could, with advantage, be shown by our cane farmers in practical nature study in connection with the economy of the various insects occurring in canefields. Unless able to tell friends from foes, certain useful parasitic or predaceous species might easily be mistaken for injurious insects and be promptly destroyed. When uncertain of the habits of wasps, beetles, caterpillars, &c., they should be dropped into a little bottle containing methylated spirits and water (half and half strength) and sent to the Entomologist for identification and advice. We are always pleased to see growers at the Meringa Experiment Station, where an interesting collection of insects is on view, which comprises about 2,200 different species, and considerably over 7,000 specimens. In addition to this general collection, our Museum contains many handsome showcases depicting the life-history of primary cane pests, coloured diagrams, and numerous spirit specimens of insects, &c., of a miscellaneous nature. This Station is one of the rail motor stops, and can be reached from Cairns in about three-quarters of an hour.

Keep a Lookout for the Weevil Borer.

At the present time, during the milling season, growers are advised to look now and then at the cut ends of cane being harvested. In the event of these beetle borers chancing to occur on a plantation, conspicuous evidence of their tunnelling will at once be revealed at those places where the cane knife has severed the basal ends of such infested cane sticks. In cases where this insect appears likely to obtain a footing, the farmer concerned should at once communicate with the Entomologist at Meringa Experiment Station.

VICTORIAN BEET-GROWERS AND THE EMBARGO.

The following extracts, taken from a report in a Gippsland (Victoria) paper, of a meeting of the beet-growers at Maffra recently with the Victorian Minister for Agriculture (Hon. W. Slater), the Hon. T. Patterson, M.H.R., Federal Representative of the district, and Mr. J. W. McLachlan, M.L.A., State member, are interesting at the present juncture, and indicate that the sugar industry of Queensland is likely to have the Victorian beet-growers behind it in connection with the embargo.

Mr. Noble, President of the Beet Growers' League, said:—"The position arising from a review of the sugar agreement by a committee appointed by the Federal Government not only occasioned concern to beet-growers but also to the State Minister for Agriculture, as it may affect the price of beet sugar as well as cane sugar in the near future. There was, therefore, a likelihood of growers being faced with more serious problems than confronted them at present. They would have to await the decision of the Federal Government in regard to the fate of the sugar industry in Australia."

Councillor T. W. Murphy, of Lindenow, said: "The future of the industry is at present in the clouds," and he hoped that "the Federal Government would prevail in regard to the agreement; it would be suicidal to interfere with the development of so great an industry." He hoped the Minister would use his influence to have the Sugar Agreement retained.

The State Minister for Agriculture said: "Possibly the agreement would be subject to modification, and that being the case, it must affect the beet-growing industry in the Maffra district, and also the price. One speaker had suggested that Victoria should be supplied exclusively from the beet factory by the industry being expanded. It was, however, utterly impossible to disregard the sugar industry as a whole. It was too late in the day for one State to put up barriers against another State. The expansion of the cane-sugar industry had been remarkable." He intended to recommend to Cabinet that prices for next season's beets be as follows:—

Up to 15 per cent.	40s. per ton.
Over 15 up to 15½ per cent.	41s. per ton.
Over 15½ up to 16 per cent.	42s. per ton.
Over 16 up to 16½ per cent.	43s. per ton.
Over 16½ per cent.	44s. per ton.

If, however, the retail price of sugar be reduced, the beetgrowers will be paid 1s. a ton less for every £1 a ton reduction. The minimum price paid to growers would be 35s. a ton.

Mr. Foley said: "Drop the price for the Melbourne housewives, and we will give up growing beet."

The Minister: "They will realise the difficulties confronting the beetgrowers."

Mr. Foley: "The Housewives' Association says, 'Shut up the beet factory.' "

The Minister said that some of his own constituents wanted to grow beet, but he could not support their requests, in their own interests. "When the cane-sugar product fell below the requirements of Australia then you could expand your industry to your heart's content, but it would be inadvisable to do at present."

Mr. McLachlan: "What is the Queensland Sugar Agreement?"

The Minister: "The price Australia has to pay for keeping the industry white."

SUGAR INCOMES.

The Director of the Bureau of Sugar Experiment Stations, Mr. Easterby, remarking on a paragraph in the Press of the 30th August, in connection with the report of the Commissioner of Income Tax, said recently that the figures did not indicate a particularly prosperous state of the sugar farmer, seeing that less than 13 per cent. pay income tax, while the remaining 87 per cent., apparently, do not make enough to pay tax. The figures show that 2 per cent. of the cane farmers pay on incomes of from £1,000 to £2,000; 4.2 per cent. on incomes of £500 to £1,000; and 6.6 per cent. on incomes from £250 to £500. For an industry that is continually being represented as being so highly prosperous the fact that 87 per cent. of the farmers engaged therein do not make enough to pay income tax is a rather startling commentary, and bears out the contention that sugar-growing is in the hands of a large number of struggling farmers.

THE BROWN CUTWORM (*Euxoa radians* Guen.).

By G. A. CURRIE, B.Sc.

PART III.

NATURAL ENEMIES.

THESE can be considered under three headings—parasites, diseases, and predators.

The word "parasite" will be used not in the strict zoological sense, but to be applied to enemies living on or in individual cutworms.

No intensive study of the parasitism of *Euxoa radians* has been made, but the following are the deductions from observations of three seasons. Parasites of the egg and larva have been found, and it is probable that the pupa is subject to some of these also.

Egg Parasites.

Small chalcid wasps (Plate VIII., fig. 7) were found to parasitise the eggs of *Euxoa radians.* These chalcids were identified by A. A. Girault as *Schedius euxoæ.* They were noted as being abundant in December, 1926,[1] but have not since been found in great numbers.

Larval Parasites.

A tachinid, *Ballardia pallipes* Curran,[10] first bred out by E. Ballard from the larvæ of *Euxoa radians,* has been found fairly often in cutworms near Brisbane. During the seasons under review, however, it has not been common in any of the areas which have been visited. In October, 1928, out of eighty cutworms three flies of this species emerged.

A large tachinid was bred out from material collected in the Mundubbera district during October, 1927, but the identification has not yet come to hand. It has not been found to be numerous in any area so far.

An unidentified braconid wasp (Plate VIII., fig. 6), probably belonging to genus *Apanteles,* has been bred from material collected at Biloela, Gatton, and from the suburbs of Brisbane. It is a small black wasp about 2 mm. in length and about 4 mm. from tip to tip of the out-spread wings. The adult emerges from a white cocoon by a circular lid at one end. The pupation period in summer is about five to six days.

A cutworm larva may be parasitised by this braconid in any of the last three instars, and sixty larvæ of the parasite have been seen to emerge from a single specimen of *Euxoa radians.* Of eighty cutworms collected at Brisbane in October, 1928, six were parasitised by this braconid. In October, 1926, a collection of cutworms at Gatton showed that out of sixty individuals 78 per cent. were parasitised, but at Biloela in October, 1927, only two out of 1,200 cutworms were found to be parasitised by the braconid.

PLATE VIII.

Parasites and Predators.

Fig. 1. Bombyliid fly (*Villa* sp.) ex pupa of *Euxoa radians* Guen. x 2.

Fig. 2. Tachinid fly ex immature stage of *Remigea frugalis* Fabr. x 2.

Fig. 3. Tachinid fly *Ballardia pallipes* Curr. ex larvæ of *Euxoa radians* Guen. x 2.

Fig. 4. Sphegid wasp *Ammophila suspiciosa* Sm. Adult female collects larvæ of *Euxoa radians* Guen. as food for her own offspring. x 2.

Fig. 5. Ichneuman wasp *Lissopimpla semipunctata* Kirby, ex pupa of *Remigea frugalis* Fabr., x 2.

Fig. 6. Braconid wasps (*Apanteles* sp.) ex larvæ of *Euxoa radians* Guen., x 10.

Fig. 7. *Schedius euxoæ* Girault, ex eggs of *Euxoa radians* Guen., x 35.

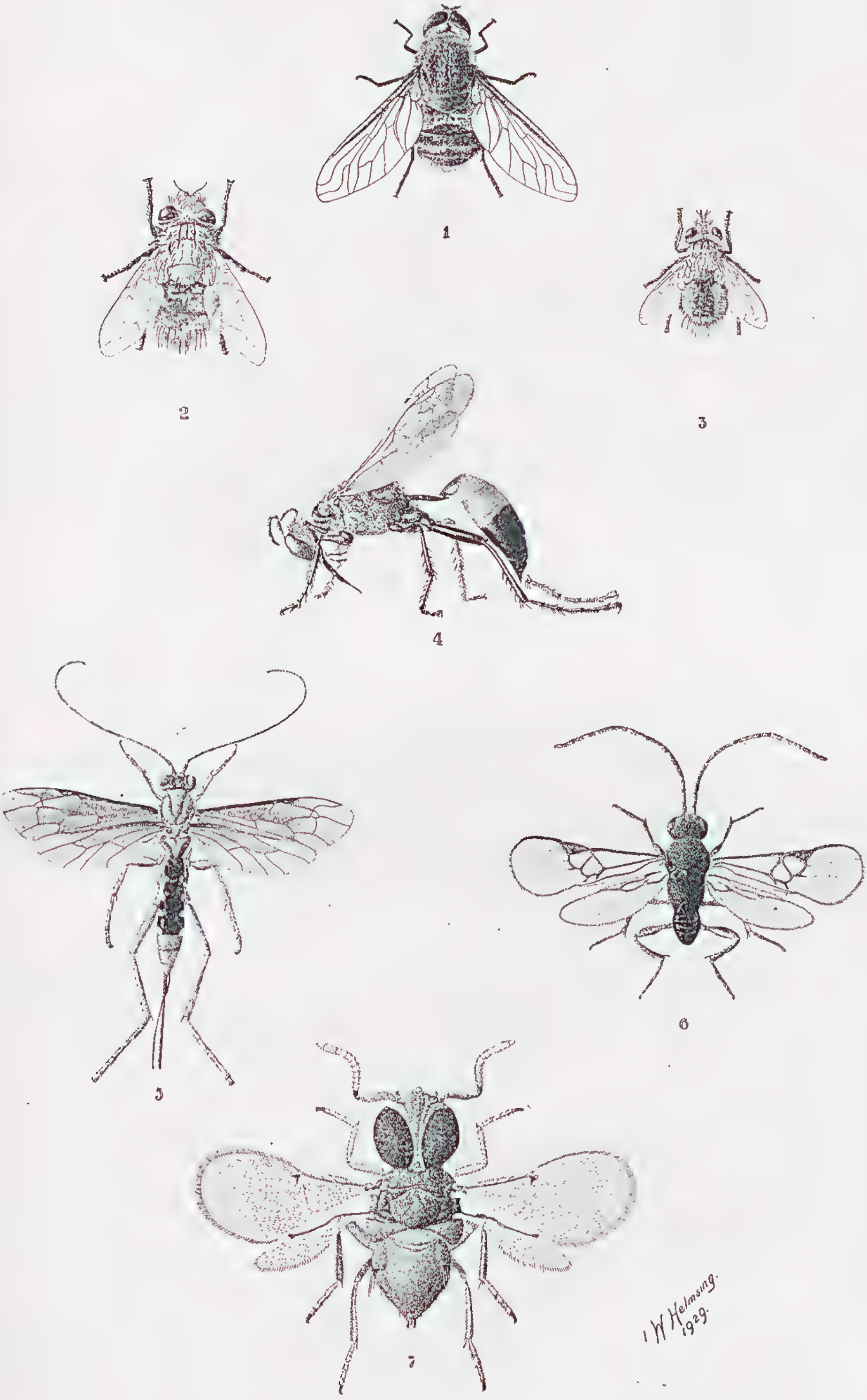


Plate VIII.

This wide diversity of results shows how impossible it is to form an idea of percentage of parastism without collections of cutworms being made at regular intervals over a long period and in different situations. The application of biometric methods to the interpretation of results is most essential in this connection.

On various occasions dark brown hymenopterous eggs have been found attached to the prothorax of the bigger sizes of *Euxoa radians* larvæ. They have hatched out into ectoparasitic hymenopterous larvæ, but have not yet been bred through for identification.

In connection with parasitism in general, it was observed that certain habitats were more favoured by one parasite than by another, so that the control value of the parasite would vary with the habitat of the cutworm. For example, cutworms working in a field which was well covered with grass and herbage intermingled with such food plants as pigweed were more heavily parasitised by the small braconid wasps than they were in more exposed situations with little cover. On the other hand, the open field with little cover was favoured by the hymenopterous predator to be described later.

It seems clear that if the cutworms were breeding in a habitat favoured by some parasite with a wide catholicity of taste in lepidopterous larvæ, it would be much more subject to attack by that parasite than if it chose some situation not so favoured. This would be particularly true where the cutworm had a wider range of tolerance of natural surroundings than any particular parasite might possess.

Pupal Parasites.

In October, 1928, Mr. L. M. Hodge, manager of the Cotton Research Station, Biloela, bred out a Bombyliid of the genus *Villa* from the pupa of *Euxoa radians*. This is the only observation of this nature recorded. (Plate VIII., fig. 1.)

Newman[11] published a photograph of a dipterous and of a hymenopterous parasite of *Euxoa radians*. The fly belongs to the Tachinidæ, and he considered the hymenopteron to be a member of the genus *Ophion*.

Diseases.

Deaths from causes other than parasites, predators, mechanical injuries, or poisons can be considered under the heading "diseases."

Septicæmia is a well-known cause of cutworm deaths, and in the Queensland experiments now under discussion large numbers of larvæ died showing symptoms of some such ailment.

A recent Russian work[12] on cutworm septicæmia established the following points:—

Cutworms which had died showing symptoms of septicæmia were examined bacteriologically and three organisms were isolated. These were *Bacillus agrotidis typhoides*, *Micrococcus saccatus* Nugula and *Bacillus subtilis* F. Cohn. All cutworms inoculated with any or all of these organisms developed symptoms of septicæmia after one or two days and

eventually succumbed. Cutworms fed on food infected with these organisms gave a much lower percentage of positive results than those inoculated with the organisms. This held true even when external conditions were most favourable to the development of the disease—i.e., high temperature with high humidity. Under these conditions only 50 per cent. of the larvæ succumbed to feeding on infected material.

Symptoms of the disease in these experiments was a sluggishness and failure to feed on the part of the larvæ, followed by flaccidity of the body and death; subsequently the dead body often became mummified.

In the case of *Euxoa radians,* high temperatures combined with high atmospheric humidity were conditions predisposing to disease. In 1926, at Biloela Research Farm, it was found most difficult to keep cutworms alive in the laboratory during the muggy weather in the latter part of December. In the field, too, the incidence of the pest suddenly decreased with the onset of wet conditions. In the laboratory at Brisbane hundreds of cutworm larvæ died off within a few days of the onset of hot humid weather in February, 1928.

The symptoms of the disease were as follows:—A caterpillar would cease feeding and its fæces would become fluid and muddy. During daylight, instead of resting well buried in soil under cover, it would be positively phototropic and come to the surface to lie there sluggishly. Sometimes it would climb upwards on any object offering a foothold and cling to the top. When the temperature of the air was high, the larva would frequently move restlessly about, obviously ill at ease and losing co-ordination between the different parts of its body. The dorsum became suffused with a pink flush and ventrally a curdy white appearance was seen. Death supervened in an hour or two in high temperature, but took longer at low temperature. The dead body was a loose sack of dirty fluid.

In the Mundubbera area on the Burnett River, a heavy attack of cutworms was experienced in October and November, 1926. A widespread epidemic broke out amongst the cutworms, mostly sixth instar larvæ being affected. Enormous numbers climbed up fence posts, clung there and died, the bodies then shrivelling up. This marked the end of the serious damage for that season.

The pathogenic organisms have not been isolated in the case of *Euxoa radians,* but there seems little doubt that the predisposing causes are high atmospheric humidity and high temperatures.

In the laboratory, conditions which encouraged the survival of cutworm larvæ obtained when temperatures ranged from 62 deg. Fahr. to about 80 deg. Fahr. daily and relative humidities from 40 to about 80 per cent., with an average about 60 per cent. In the field, where maximum temperatures in excess of 90 deg. Fahr. were frequently experienced for short periods during the day, with night temperatures about 10 deg. Fahr. and "medial" relative humidities, conditions were very favourable to cutworm survival and rapid development.

The range of humidities and temperatures experienced during November, when cutworm larvæ were thriving well and had no losses, is given below, contrasted with a week in February when the cutworms were dying off rapidly.

TABLE VII.

AVERAGE TEMPERATURES AND HUMIDITIES FOR ONE WEEK DURING NOVEMBER, 1927, IN WHICH CUTWORMS WERE HEALTHY AND NO LOSSES OCCURRED.

Date.	Temperature, °F.		Relative Humidities, %.		
November.	Maximum.	Minimum.	9 a.m.	3 p.m.	9 p.m.
1st	79·9	61·7	53	52	77
2nd	81·2	62·1	58	51	74
3rd	80·6	67·0	57	53	76
4th	81·5	66·2	62	57	83
5th	85·1	67·0	86	40	74
6th	80·4	62·1	57	51	74
7th	80·7	67·2	65	51	74

AVERAGE TEMPERATURES AND HUMIDITIES FOR ONE WEEK DURING FEBRUARY, 1928, WHEN CUTWORMS WERE DISEASED AND DYING OFF RAPIDLY.

Date.	Temperature, °F.		Relative Humidities, %.		
February.	Maximum.	Minimum.	9 a.m.	3 p.m.	9 p.m.
14th	84·2	72·1	85	71	97
15th	85·2	73·7	87	81	88
16th	87·7	74·9	96	88	90
17th	77·3	74·6	92	99	89
18th	79·3	74·4	95	93	95
19th	83·0	74·4	88	93	93
20th	79·5	72·3	94	99	83

A few cases occurred where cutworms newly dead contained fungus growth, and a white fungus covered the body after a short period.

Some pupæ died having fungus growth protruding through the spiracles, but in no case was this common in the period under review, and no identification was made.

Predators.

Birds are effective enemies of insects in general and lepidopterous larvæ render heavy toll to them. Domestic poultry and more particularly turkeys devour large numbers of larvæ. Once they have found the cutworm larvæ hiding just under the surface, they will most assiduously search for them.

Wild birds of insectivorous orders soon congregate to the feast when very heavy attacks of caterpillars are in progress, although cutworms seem to be more immune from this form of control than the larvæ of *Heliothis obsoleta,* which do not hide in the soil. The pee-wee or Magpie Lark (*Grallina cyanoleuca*), the Grey or Collared Butcher Bird (*Cracticus torquatus*), the Pied Butcher Bird (*Cracticus nigrogularis*), the crow (*Corvus cecilæ*), the Pied Crow Shrike or Pied Currawong (*Strepera graculina*), and the Straw-necked Ibis (*Threskiornis

spinicollis) have been seen eating cutworms, and the adult moths may be snapped up by these and other birds.

The larvæ of some carabid beetles have been seen to attack and devour cutworm larvæ, while spiders may sometimes catch the adults in their webs. Being general feeders, however, these forms are not likely to act as effective controls.

A most useful predator on *Euxoa radians* larvæ was observed at work in the field at Biloela during the seasons of 1926, 1927, and 1928. This is a predatory wasp *Ammophila suspiciosa*, which is included as a predator in spite of the fact that her larvæ live ectoparasitically on the cutworms. Her own habit of actively searching for cutworms is predatory. The female is about an inch in length and has a slender petiole to the abdomen. (Plate VIII., fig. 4.) The head, thorax, legs, petiole, and caudal half of the abdomen are black, while the rest of the abdomen is a rich yellow brown. The wings are transparent, and of a reddish brown shade. The males are much smaller than the females. The females work during sunny hours and are found in dull weather resting under maize leaves or some other cover of a similar nature. In October, November, and December they are to be seen visiting the flowers for nectar in the sunshine or searching diligently for their prey.

The female, with the urge of the future upon her, first digs a hole almost vertically into the ground, of a width sufficient to allow her easy ingress. The forelegs and mandibles only, seem to be used in digging, the earth being thrown back in a fine shower. Suddenly she stops digging and runs off in search of a cutworm. Her movements are jerky and her bearing alert as she runs rapidly amongst the vegetation like a terrier hot on a scent. She stops, digs in a flurry, and drags forth a squirming larva which is quickly stung into a state of paralysis. She then grips it on the ventral surface between the head and the first pair of thoracic legs, swings it under her, and runs off rapidly astride her victim's motionless body.

When nearing her burrow she ascends some eminence such as a clod, stick, or plant and lays the cutworm carefully thereon, then flies to the hole.

There she digs furiously, carrying a load of earth up to the surface, returning for another, backing out with that, and so on till she feels that the depth is sufficient. She then returns for the cutworm, carries it to the burrow, and herself entering first backwards, pulls it down after her, head first. Almost immediately she reappears and starts scratching the earth back into the hole. When some earth has been sent down she runs down the hole and butts it firm with her head, repeating this at intervals until surface level is reached.

When the hole is almost completely filled she chooses a stone of suitable size, places it on the entrance and then beats the earth round it into position. After patting the surface flat and smooth she flies off.

On being dug up the burrow is found to be about $2\frac{1}{8}$ inches deep, nearly vertical, and at the bottom the larva is coiled up with the large

white sausage-shaped *Ammophila* egg fixed to one of the anterior abdominal segments. Only larvæ in the fifth and sixth instars were chosen by the wasp as food for her offspring.

A small grey fly about the size of a house fly, with yellow bands on its abdomen (probably a bombyliid) often accompanies the female in her search, and sits by on a convenient stone while the burrow is being opened up. Whenever the prey has been pulled into the hole the fly hurls itself down after it, emerges again almost immediately, and would appear to be parasitic on the *Ammophila* larva.

The subterranean and nocturnal habits of cutworms give some immunity from many natural enemies, but the digging wasp has the secret of finding them out in their hiding places.

Photo: J. A. Weddell.

Plate 107.—Display by the the Division of Entomology and Plant Pathology at the recent Cleveland Show.

BRIGHT TOBACCO IN NORTH QUEENSLAND.

Compiled by N. A. R. POLLOCK, H.D.A., Senior Instructor in Agriculture.

In the subjoined notes Mr. Pollock gives some interesting particulars of prospective tobacco producing country in the North, together with an account of tests made on leaf produced in the seasons 1927-28 and 1928-29. They will be welcomed by all concerned with the opening up of new furrows in agricultural development in this State.—Ed.

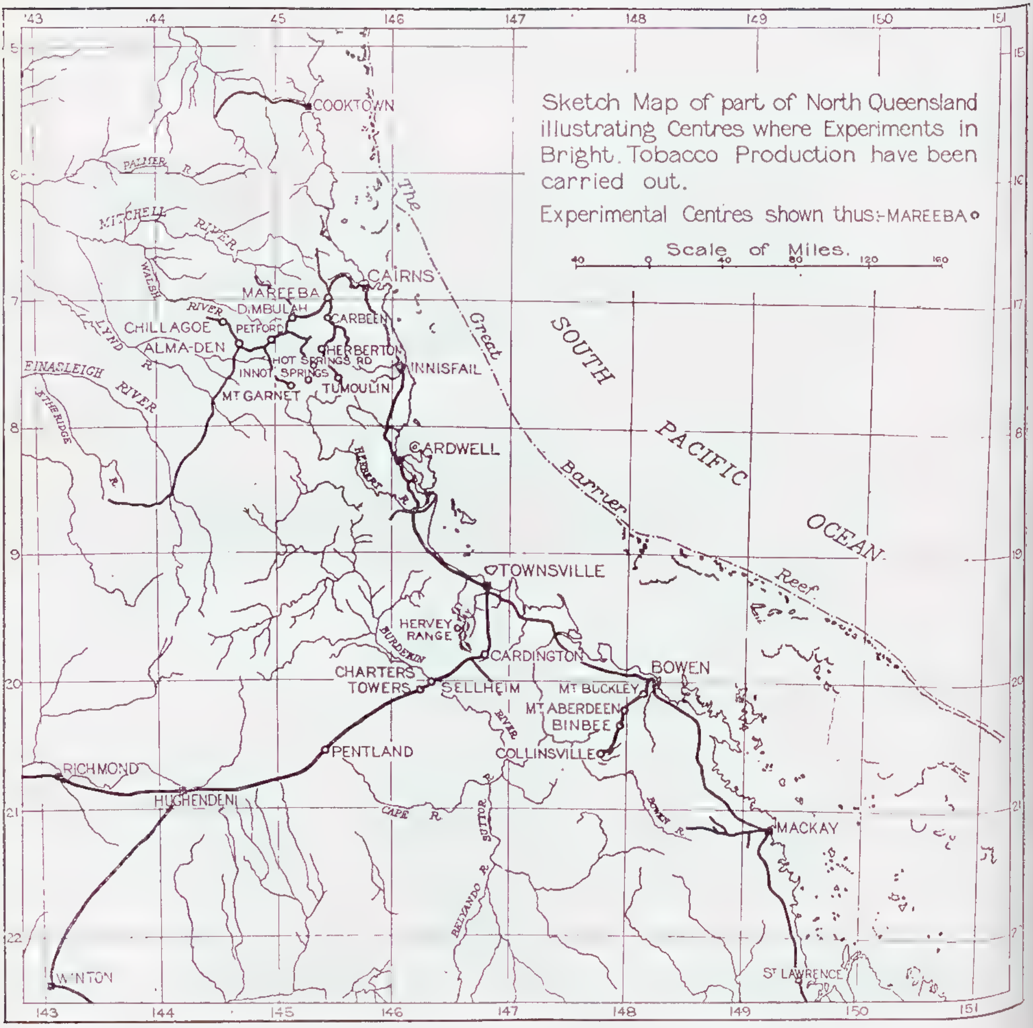
THE initial experiments in the production of bright tobacco for pipe and cigarette smoking carried out by the Queensland Department of Agriculture in collaboration with the Australian Tobacco Investigation, in a series of exploratory plots in the 1927-28 season, tested an area of some 30,000 square miles of country, from the latitude of Mareeba in the north to that of Bowen in the south, a distance directly of 250 miles, and inland to Pentland and Chillagoe, distant respectively 180 and 96 miles due west from the coast.

The localities of these plots are shown on the accompanying map, as at Mount Buckley, Mount Aberdeen, Binbee, and Collinsville on the Bowen to Collinsville Railway; Hervey's Range, some 25 miles from Townsville, on the old Georgetown road; Cardington, Sellheim, Charters Towers, and Pentland on the Great Northern Railway; and Mareeba, Dimbulah, Petford, Alma-den, Chillagoe, Mount Garnet, Innot Springs, Hot Springs road, Tumoulin, Herberton, and Carbeen, which are centres on the highlands west of Cairns; and the volcanic soils of the Atherton Tableland.

These plots, twenty-five in number, were grown on various classes of soil commonly met with that were considered as possibly suited for the production of bright tobacco. The results were uniformly good, giving evidence that a very large proportion of bright leaf could be cured from crops grown in each district, while the qualities of burn, texture, and aroma under test were most encouraging.

Culling from the progress report of the Australian Tobacco Investigation to January, 1930, and Bulletin 2 of that Investigation entitled "The Smoking Qualities of Australian Tobacco," a preliminary report presented to the Executive Committee by C. M. Slagg, M.Sc., Director of the Australian Tobacco Investigation, the following evidence of the superior quality of bright tobacco leaf grown in North Queensland is offered:—

"In general, the texture and colour of the 1928 experimental leaf from North Queensland was quite good. A high percentage of bright colour was obtained, and in addition to a fair quantity of thin cuttery tobacco, the fillers and wrappers showed good elasticity and the quality of retaining pliability and a soft velvety feeling even when exposed to a dry atmosphere for long periods. Smoking tests were made on all samples, and the burn and ash were found excellent. The aroma, while


Sketch Map of part of North Queensland illustrating Centres where Experiments in Bright Tobacco Production have been carried out.
Experimental Centres shown thus:- MAREEBA
Scale of Miles.
COOKTOWN
CAIRNS
MAREEBA
DIMBULAH
CARBEEN
CHILLAGOE
PETFORD
ALMA-DEN
HERBERTON
HOT SPRINGS RD
INNOT SPRINGS
INNISFAIL
TUMOULIN
MT GARNET
CARDWELL
TOWNSVILLE
HERVEY RANGE
CARDINGTON
CHARTERS TOWERS
SELLHEIM
BOWEN
MT BUCKLEY
MT ABERDEEN
BINBEE
COLLINSVILLE
PENTLAND
RICHMOND
HUGHENDEN
MACKAY
ST LAWRENCE
WINTON
SOUTH PACIFIC OCEAN
The Great Barrier Reef
PALMER R.
MITCHELL RIVER
WALSH
LYND R
EINASLEIGH RIVER
ETHERIDGE R.
HERBERT R.
BURDEKIN
BURDEKIN RIVER
CAPE R.
SUTTOR R.
BELYANDO R.
BOWEN R.

different from American tobacco, and also different from the aroma of tobacco thus far tested from other parts of Australia, was for the most part mild and not definitely objectionable.

The leaf from all twenty-five plots was graded into 136 lots, which Mr. Slagg tabulated as follows:—

Grades.	Per cent.	Colours.	Per cent.
Lugs	7·10	Lemon	19·44
Cutters	20·93	Orange	45·56
Wrappers	5·49	Bright mahogany	8·29
Fillers	66·48	Mahogany	26·71
		Dark	0·0
	100·00		100·00

TABLE IV.

Summarised Comparative Aroma of some Selected 1928 Australian Tobacco Samples.

State.	Number of Growers Crops Tested.	Number of Lots Tested.	Lots with Mild, Agreeable Aroma.		Lots with Passable Aroma.		Lots with Indifferent to Poor Aroma.		Lots with Bad Aroma.	
			No.	Per Cent.	No.	Per Cent.	No.	Per Cent.	No.	Per Cent.
Victoria	20	48	5	10	14	29	15	31	14	29
New South Wales ..	14	44	5	11	7	16	18	41	14	32
North Queensland ..	25	136	44	32·5	60	44	30	22	2	1·5
South Australia	13	29	2	7	6	21	9	31	12	41
Western Australia ..	19	27	4	15	9	33	9	33	5	18
Tasmania	1	6	0	0	2	33	4	66	0	0
	92	290	60	..	98	..	85	..	47	..

TABLE V.

The Comparative Burn (Combustion) of some Selected 1928 Australian Tobacco Samples.

State.	Number of Growers' Crops Tested.	Number of Lots Tested.	Number of Lots with Good to Excellent Burn.	Number of Lots with Indifferent to Fair Burn.	Number of Lots with Poor to very Poor Burn.
Victoria	20	48	44	3	1
New South Wales ..	14	44	43	1	0
North Queensland ..	25	136	136	0	0
South Australia	13	29	2	24	3
Western Australia ..	19	27	12	12	3
Tasmania	1	6	6	0	0

"All of the North Queensland 1928 lots were retested for smoking qualities after twelve months ageing in a packed condition. The aged samples were compared directly with the samples cut from the freshly-cured leaf in 1928. In nearly every case the aroma was found to be

better in the aged samples. The aroma was mellower and better rounded out, lacking much of the sharpness and pungency exhibited by the samples cut before ageing."

It will be noted from the foregoing that while no comparison of grades and colours is instituted with leaf grown elsewhere, those with aroma and burn are outstandingly in favour of that from North Queensland.

A regrettable feature of tobacco leaf produced in southern latitudes of which complaint has been made is its failure to improve when aged. North Queensland leaf, on the other hand, according to Mr. Slagg, has shown definite improvement with age.

In consequence of the uniform results obtained in all the districts tried, it was decided by the Australian Tobacco Investigation to establish an experimental tobacco farm at Mareeba, since that district, besides offering excellent climatic conditions, provided very large areas carrying the class of soil considered most suitable for production.

Evidence in this connection extracted from the report of the Select Committee on Tobacco Growing in Australia is as follows, Mr. R. W. Howell, Superintendent of the Tobacco Experiment Station at Mareeba, being the witness:—

> Question 4622. *By Mr. Slagg:* Did you take part in the tests made with Queensland leaf in 1927 and 1928?—Yes.
>
> Question 4623. Do you recollect that in those tests we found very little difference in the smoking qualities of the flue-cured tobacco obtained from the 1927-1928 exploratory test plots over a wide range of country extending from Bowen in the south to Mareeba in the north, provided that the soil conditions were approximately similar?—Yes, they were practically identical.
>
> Question 4624. Do you also recollect that it was on that account that we decided to concentrate our experimental work to North Queensland, at Mareeba?—Yes. The area chosen for experimental work was selected because it was representative of a large area of country that possessed soil and climatic conditions conducive to the production of the best tobacco. It thoroughly represented the North.

During the seasons 1928-29 and 1929-30 further trials were conducted at this farm under the supervision of an officer of the Investigation with a wide knowledge and lengthy experience of tobacco culture, while in other districts at Pentland, Charters Towers, Hervey's Range, and Chillagoe, crops on a commercial scale and on experimental areas were supervised by officers of the Department of Agriculture.

The result from these further trials was, in each instance, to repeat the success obtained in the exploratory plots and to establish the fact that bright tobacco possessing good burning qualities, accompanied by a pleasing and agreeable aroma, such as would be acceptable to the smoking public of Australia and which would be readily purchased by the manufacturers, could be produced on the poor sandy soils of the Mareeba and other districts of North Queensland possessing similar climatic conditions.

The prices received for the various grades of leaf purchased by the British Australasian Tobacco Company Pty., Ltd., Sydney, from the

small crops grown at Pentland, Charters Towers, and Hervey's Range, respectively, were, including bonuses:—

PENTLAND.

Grade.	Price per lb. s. d.
Lemon	3 5
Bright mahogany	3 0
Mahogany, lugs	2 2

CHARTERS TOWERS.

Variety: South's Improved Hester—	s. d.
Lemon, long	3 0
Lemon, short	2 2
Bright mahogany A	3 4
Bright mahogany B	3 1
Short bright mahogany A	2 1
Long mahogany A	3 0
Short mahogany A	1 7
Long mahogany B	2 0
Short mahogany B	1 6

Variety: White Stem Orinoco—	s. d.
Lemon	3 6½
Lemon scrap	3 0
Long bright mahogany A	3 3
Long bright mahogany B	3 1½
Short bright mahogany B	2 2
Long mahogany C	2 1
Short mahogany C	1 9

HERVEY'S RANGE (Townsville District).

Variety: South's Improved Hester—	s. d.
Lemon, long, 1A	3 6
Lemon, short, 1A	3 3
Lemon 1B	3 8
Lemon, scrap	3 3
Orange, long	2 2
Orange, short	1 6
Orange, lugs	2 0
Mahogany A	3 1
Mahogany B	3 0

Variety: White Stem Orinoco—	s. d.
Lemon	3 7
Orange A	3 4
Orange B	2 1
Orange, lugs	3 0
Mahogany A	2 1
Mahogany B	1 4

All the crops from which these lots of leaf were marketed had been sown rather late in the season and had experienced frost to such an extent as to disallow the computation of the weight of leaf per acre; they were, however, estimated to yield between 500 and 700 lb. per acre. In the prices obtained, those of 3s. and over included a bonus addition of 1s., those of 2s. and over of 3d., while those under 2s. received no bonus addition.

Plate 108.—A Portion of this Year's Crop at the Experiment Station, Mareeba. Note the class of soil.

Plate 109.—On the Experiment Station at Mareeba, showing a Portion of the 1930 Crop and Flue-curing Barn and Bulk Store.

In forwarding the account sales the purchasers remarked:—

"We need hardly point out to you on the present valuations of these small lots of leaf and assuming a normal season with a normal crop, the resultant yield to the grower would be extremely profitable on our present valuations without any bonus being paid."

Dealing with the grades of leaf from these centres together with a lot grown at Chillagoe and that produced at the Tobacco Experiment Station at Mareeba, Mr. Slagg, in his preliminary report, advises as follows:—

1929 North Queensland Plots.—In addition to leaf grown at Mareeba, a total of five outside plots was also cured and tested. Extremely wet weather during the growing season interfered seriously with the growth of all plots except those at Chillagoe. However, some leaf was secured from most of the areas, and smoking tests made. Due to the unfavourable season, the leaf texture was much heavier than in 1928. The leaf colours, however, were better, due to the fact that there were larger lots of leaf available for curing at one time, and to a new and better curing kiln being built. Two private kilns were also constructed, one at Hervey's Range, near Townsville, and one at Charters Towers. Most of the leaf grown at Hervey's Range, and all of that grown at Charters Towers and Pentland, was cured in these kilns. One small lot of Hervey's Range tobacco was transported to Mareeba and cured there. The summarised data on leaf texture, colour, and aroma follow:—

Texture.—Of seven exploratory test plots in North Queensland in 1928-29, two, or 29 per cent., were rated as possessing a very good texture, and five, or 71 per cent., as having a good texture.

Colour.—Eight per cent. was lemon, 76 per cent. was orange, 10 per cent. was mahogany, and 6·5 per cent. was dark.

Aroma.—Of a total of thirty-three lots tested, 82 per cent. were rated as possessing a mild and agreeable aroma, 15 per cent. were passable or fair, and 3 per cent. possessed an indifferent to poor aroma.

1928-29 Exploratory Test Plot Summary.

The following tables show in summarised form the data for 1928-29 from the exploratory test plots in the different States. It must be pointed out, however, that it is very difficult to assort properly into a small number of classes of texture and colour, leaf produced on different and widely-separated soils. The aromas encountered are also of widely differing character, even when mild and agreeable.

Summary of Leaf Texture in Exploratory Test Plots 1928–29.

State.	No of Plots.	Percentages.					
		Very Good.	Good.	Fairly Good.	Fair.	Poor.	Very Poor.
Victoria	8	..	..	25	..	75	..
North Queensland	7	29	71	..	..	..	..
South Australia	15	..	..	..	7	73	20
Western Australia	20	..	..	20	25	30	25

SUMMARY OF LEAF COLOURS IN EXPLORATORY TEST PLOTS, 1928-29.

State.	Number of Plots.	Percentages.				
		Lemon.	Orange.	Mahogany.	Dark.	Nondescript.
Victoria	8	0·1	15·7	58·4	3·2	22·6
North Queensland	7	7·8	75·9	9·8	6·5	..
South Australia	15	..	..	34·2	59·1	6·7
Western Australia	20	1·1	10·9	62·3	5·0	20·7

SUMMARY OF SMOKING AROMA IN EXPLORATORY TEST PLOTS, 1928-29.

State.	No. of Exploratory Plots.	No. of Lots Tested.	Percentages.			
			Mild and Agreeable Aroma.	Passable or Fair Aroma.	Indifferent to Poor Aroma.	Bad Aroma.
Victoria	8	34	17	21	24	38
North Queensland	7	33	82	15	3	..
South Australia	15	18	..	6	55	39
Western Australia ..	20	35	40	29	28	3

The superiority of North Queensland leaf over that grown elsewhere is again outstanding in the features of colour, texture, and aroma that are considered when purchase is made by manufacturers.

Crops grown in the North during the season 1929-1930 have not yet been reported on by Mr. Slagg, but it is understood equal if not better results will be forthcoming. The result of a small crop grown in the Bowen district during this season, in proportion of bright colour, texture, burn, and aroma, gives promise of comparing very favourably with that produced in other Northern centres.

Further support of the suitability of North Queensland for bright tobacco production will be noted in the following sworn evidence given in the inquiry of the Select Committee on Tobacco Growing recently concluded:—

Evidence given by Mr. C. J. Tregenna, Tobacco Expert, Department of Agriculture, N.S.W.—

> Question 1299. Would you be prepared to smoke cigarettes made half of Australian and half of American leaf?—If the Australian leaf came from Stawell, in Victoria, or North Queensland, a 50-50 mixture with American tobacco would give a satisfactory cigarette. The position would be quite different if tobacco grown in Tamworth, Manilla, or Tumut were used.
>
> Question 1341. Do you think that ultimately almost the whole of our tobacco requirements will be produced in Australia?—Yes.
>
> Question 1342. Do you think that that tobacco will be produced in the existing areas?—I think it will come from North Queensland.
>
> Question 1359. What is your opinion of North Queensland as a tobacco-growing area?—It is the only place in Australia that I

have visited which I think will produce high-grade tobacco. I think that we can grow there tobacco which will displace much of the American product now imported.

Question 1360. To what parts of North Queensland do you refer?—The country around Mareeba. The leaf grown there is the best Australian leaf I have seen.

Evidence given by Mr. N. A. R. Pollock, Senior Instructor in Agriculture, Department of Agriculture, Queensland—

Question 4389. What percentage of bright leaf do you anticipate can be produced from the Mareeba lands?—In normal seasons the most suitable land in the Mareeba district could produce almost 100 per cent. bright tobacco if handled by experienced labour; certainly over 90 per cent.

Evidence of Mr. R. W. Howell, Supervisor, Australian Tobacco Investigation, stationed at Mareeba Experimental Station, North Queensland—

Question 4577. Do you expect a crop of half a ton to the acre?—No; 500 to 750 lb. would be as much as we could expect. Perhaps with very favourable seasons one could expect a half a ton to the acre.

Question 4578. Do you expect to get 100 per cent. bright leaf off the land?—Very nearly. I have seen 100 per cent. bright leaf gathered at Mareeba. At a conservative basis, I would average it from 80 per cent. to 90 per cent. bright leaf.

Question 4579. *By Mr. Jones:* Do you class mahogany as "bright"?—Only bright mahogany.

Question 4580. Do you get much lemon leaf in the Mareeba district?—I have seen crops cured in that district with 100 per cent. lemon leaf. I have never seen a similar result in America. My report gives a coloured percentage for twenty-two plots, some of which were planted in very heavy ground that could not be expected to produce good tobacco.

In the foregoing evidence the reference to Mareeba lands may be taken to refer generally to all districts in which bright tobacco has been produced in North Queensland, for the results tabulated by Mr. Slagg and referred to in his report were the outcome of examination of leaf from all districts without consideration to any specific locality. So it may be understood that leaf of excellent quality may be produced in the Bowen to Collinsville areas and Townsville, Charters Towers to Pentland areas equally with that of the Mareeba and other centres on the highlands west of Cairns and the volcanic areas of the Tableland.

Soils.—The soils in all districts tested for tobacco-leaf production are very similar, being sandy, varying slightly in depth, character of subsoil, texture, and fertility, but all proved as capable of producing leaf of good colour, texture, and smoking quality. Such soils were derived very largely from granitic rocks, as well as from sandstones, of the desert and other series, but, of whatever origin, have proved suitable for tobacco production. It cannot be said that the soil of any one district is superior to that of another, but certain classes considered most suitable will, of course, vary in their extent in different districts. The most favoured soil is that of fine sandy character, light in texture, preferably of a foot or upwards in depth, that is naturally well drained or so situate as to easily be made so.

Plate 110.—Harvesting Leaf, Hervey Range, 1930
Note how lower leaves ripen first.

Plate 111.—Tobacco Crop, Experiment Station, Mareeba, 1930.

Climates.—While soils as far as character is concerned suggest no great superiority of one district over another, the climates certainly differ. While all are satisfactory for the health and wellbeing of the settler, being more pleasant, perhaps, in those of the highlands than in those of lower altitude, the degree of atmospheric humidity, prevalence or otherwise of direct sunshine, distribution of rainfall, and degree of evaporation are factors in the production of leaf quality which allow of discrimination.

Thus districts contiguous to others of heavier and more persistent rainfall, such as those on the highlands west of Cairns and the volcanic area of the Tableland, enjoy a more suitable degree of atmospheric humidity, a prevalence of passing clouds, allowing intermittent shade, with consequent lower evaporation and a more even temperature, as well as a better distributed rainfall, than do others less favourably situated.

Altitudes.—The altitudes of the districts proved for bright tobacco in North Queensland have had no effect on the quality of leaf produced, that at Mount Buckley, 91 feet above sea level, being equal to that grown at Tumoulin, 3,162 feet above sea level. The following are the altitudes above sea level of the localities where the exploratory plots were grown:—

	Feet.		Feet
Mount Buckley	91	Carbeen	1,988
Mount Aberdeen	336	Herberton	2,890
Binbee	642	Tumoulin	3,162
Collinsville	601	Dimbulah	1,512
Hervey's Range	1,400	Petford	1,577
Cardington	330	Mount Garnet	2,131
Sellheim	835	Innot Springs	2,200
Charters Towers	1,004	Hot Springs road	2,250
Pentland	1,318	Almaden	1,617
Mareeba	1,325	Chillagoe	1,154

Season for Tobacco.—To produce the best quality of tobacco leaf it should be grown in the warmest months of the year when sufficient rainfall is experienced. This, in North Queensland, coincides with the rainy or wet season, which commences usually in December and embraces the following months of January, February, and part of March.

Tobacco plants are raised in seed-beds, sown usually during the second or third week of November, which are watered by hand to allow of plants four to six weeks old being available for setting out in the field shortly after the first falls of rain, opening the wet season, have provided a sufficiency of moisture in the soil.

Growth will then be made through January and February and the leaf ripen for harvest in March and April, when finer weather can be expected to prevail.

Rainfall.—The monthly average rainfall, during the growing season, of recording stations nearest to the localities where exploratory plots were grown are detailed as follows:—

District.	December.	January.	February.	March.	April.
	Inches.	Inches.	Inches.	Inches.	Inches.
Bowen	4·46	10·20	8·97	4·71	2·88
Townsville	5·58	11·29	11·46	7·56	3·54
Charters Towers	3·55	5·54	4·51	3·92	1·63
Pentland	3·62	6·77	4·58	3·68	1·51
Mareeba	4·29	9·32	7·48	7·46	2·87
Mount Garnet	5·32	7·16	5·63	5·58	1·77
Herberton	5·72	9·52	7·67	8·93	5·06
Chillagoe	6·00	8·01	4·10	5·82	1·40

Tobacco Varieties.—While sufficient data has not yet been secured to indicate the most suitable variety for any one district, the uniformly good results obtained with the Hickory Pryor and Warne varieties wherever tried enables them to be recommended.

PROPOSED TOBACCO SETTLEMENT.

In view of the evidence adduced that the production of bright tobacco in suitable districts of North Queensland will prove a profitable industry to the grower, and tend to obviate the necessity of sending huge sums yearly overseas for Australian requirements in that direction, the Queensland Government has decided to make available for immediate settlement, under specially favourable conditions, areas in the Mareeba district, which have been specially selected with due attention to ease of access, soil quality, water supply, &c., as ideally suited for tobacco production on a commercial scale. The designs of these areas into 26 and 10 portions respectively are now available.

Areas.—It will be noted that the maximum area of any portion is 219 acres and the minimum 105 acres, and that the amount of first-class tobacco soil on each farm will range from 65 to 126 acres.

Soil.—The soil suggested for tobacco production on each portion is a sandy soil of fine texture a foot and upwards in depth over a decomposed granitic subsoil or cement, comparing more than favourably with that on the Tobacco Investigation Farm, near Mareeba.

Water.—Most of the portions have frontages to creeks with permanent water, but on five or six portions it will be necessary to sink wells to provide water during the dry months, July to December. These wells, however, will not be very deep and will tap a sufficient supply for all requirements.

Topography.—Level to gentle slopes.

Access.—The portions designed on Granite Creek will be served by a siding 7 miles from Mareeba, on the Chillagoe Railway, which is within the area and from which the furthest farm is less than 3 miles distant, and also by road from Mareeba. The portions designed at Dimbulah will be served by the Dimbulah Railway Station, which is within 3 miles of the furthest farm by an easy road.

Flora.—The natural grasses on each area are mainly Kangaroo (*Themeda* sp.), Bunch and tall Spear (*Heteropogon* sp.), Blady (*Imperata* sp.), and others of little fodder value. The trees and shrubs on the soils suggested for tobacco are largely Bloodwood (*E. corymbosa*), Western Bloodwood (*E. terminalis*), with occasional examples of Grey Box (*E. Leptophleba*), Narrow-leaved Ironbark (*E. crebra*), Poplar Gum (*E. Alba*), Bluegum (*T. tereticornis*), Cabbage Gum (*E. papuana*), Moreton Bay Ash (*E. tesselaris*), and species of Acacia, Grevillea, Alphitonia, Melaleuca, &c.

Clearing Costs.—The trees, while being plentiful, are not large, so that clearing costs will not be heavy. It is not anticipated that a cost of £12 per acre will be exceeded on any portion, an average being estimated at £9 per acre. When the trees have been killed by ringbarking or poisoning for two years, it is expected that clearing costs will be reduced by 50 per cent. when tree pullers are used in the wet season.

General.—The areas exhibit absolutely virgin soil, no occupation in any form having ever taken place. While there are large areas of similar soil in the district of equal quality, preference was given to these areas for immediate occupation owing to their ease of access, which will facilitate the cropping of 5 acres on each farm desired during the coming season.

Descriptive Notes of the Mareeba District as a Suitable Tobacco-growing Area.

Town.—Mareeba is an important town on the railway, 46 miles inland from Cairns, which is connected by rail with Townsville and Brisbane, distant, respectively, 211 and 1,043 miles.

It is a busy railway centre, being the junction of the Tableland and Chillagoe Railways, and also the point of departure for trains on the Mount Molloy line, which junctions with the main line to Cairns at Biboohra, 5 miles distant.

The town is situated at the confluence of Granite Creek and the Barron River, and has a population of approximately 1,500 inhabitants. It is well laid out and possesses an excellent water supply, which is pumped from the Barron River to reservoirs and thence reticulated throughout. Excellent conveniences exist in a general hospital, banks, telegraph and post office with telephone exchange, court house, hotels, stores, &c. The bacon factory of the Atherton Tableland Co-operative Bacon Company is situated at Floreat, within a mile of the town, and an up-to-date meatworks will be found at Biboohra 5 miles on the railway towards Cairns.

District.—The country, presently included, in the Mareeba district, extends for perhaps 8 miles east and southward and for upwards of 40 miles north to south-westward of the town.

Altitude.—The altitude above sea level ranges from 1,325 feet at Mareeba to slightly over 2,000 feet in other parts, the major portion having an average altitude of around 1,500 feet.

Climate.—The climate is an excellent one, extremes of heat and cold being very rare. A maximum shade temperature of 100 degrees is rarely encountered, while frosts in winter seldom occur.

Though situated in the tropical zone and within 17½ degrees of the Equator, the unpleasant steamy heat peculiar to the tropical coast in summer is not experienced, owing to the higher elevation and lighter average annual rainfall, and the nights are invariably cool.

Suitability for Tobacco.—The climate is considered to be ideal for the production of bright tobacco, since the daily temperatures in the growing season rarely exceed 90 degrees in the shade by day or fall below 70 degrees at night. Being contiguous, in addition, to the heavier rainfall area extending from Cairns in the east to the Tableland in the south, a desirable degree of atmospheric humidity is maintained, which with the intermittent shade from passing clouds disallows excessive evaporation, and thus permits that evenness of growth and progress to maturity so desirable in the production of high-class tobacco leaf.

Rainfall Statistics.—The rainfalls recorded at the Mareeba Post Office will apply very generally to the whole of the district. From these records it is noted that the annual average rainfall over a period of

thirty-two years is 34·92 inches, while the monthly average precipitation for the same period is—

	Inches.		Inches
January	9·31	July	0·32
February	7·48	August	0·17
March	7·46	September	0·26
April	2·87	October	0·56
May	0·52	November	1·23
June	0·51	December	4·29

Soils.—The soils, it is understood, compare very favourably, especially in texture, with the best of those occurring in the bright tobacco-producing districts of the United States of America. They are generally derived from the disintegration of granitic rock and characterised by a desirable degree of fineness with a very small proportion of clay.

In the total elements of fertility they must be classed as poor, especially in phosphoric acid and nitrogen content, while that of potash and lime can be classed as but fair.

The amount of humus and decaying organic matter is low, but sufficient for some years before the necessity for a supplement, by ploughing under a growing crop, will arise.

Value for Tobacco.—Generally speaking, the soil is of a character that will allow a ready response to the application of fertiliser, and in this connection is admirably adapted for tobacco production since the growth of the plant can be regulated by the amount of fertiliser applied.

Depth of Soil.—The depth to which these soils occur are from 12 inches to several feet, occasionally over a porous clayey subsoil, but generally bottoming on decomposed granite or a cement.

Drainage.—Tobacco soil areas occur, for the most part, on gently sloping ridges and possess, generally, a good drainage under ordinary falls of rain. Provision, however, is advisable in deep, open drains to carry off the surplus of storm waters and the seepage from higher levels.

The tobacco plant is adversely affected by saturated soil conditions, but in a recent instance tobacco plants growing on an area so drained at the Tobacco Experiment Farm successfully withstood a phenomenal rainfall of 15 inches in a week.

Water Supplies.—The district under review may be described as excellently watered, for though most of the streams are perennial, a number cease to flow during the dry months, from June to December. During this period, however, water can be obtained in sufficient quantity for requirements under the sands in these creeks, or in wells nearby, at no great depth. In the months of heaviest average rainfall—from December to March—water supplies are abundant in all directions.

Topography.—The country varies from comparatively level, through gentle slopes, to hilly, and offers little difficulty in obtaining easy gradients in roadmaking throughout. During heavy rains little or no damage can be expected from flood waters.

Tree growths occur as an open forest and comprise in Eucalypts principally Bloodwoods (most common on tobacco soils), Grey Box. Narrow-leaved Ironbark, Poplar Gum, Cabbage Gum, Blue Gum, and Moreton Bay Ash, with species of Acacia, Grevillea, Alphitonia,

Plate 112.—Tobacco Crop at Hervey Range

Plate 113.—Stringing Tobacco Leaf Preparatory to Placing in the Flue-curing Barn, Hervey Range, 1930.

Erythrophlocum (Ironwood), Casuarina, Callitris (Cypress pine), &c. In certain parts Cypress pine is rather plentiful, but most often on country that is somewhat broken.

Clearing Costs.—The cost of clearing the land preparatory to production will not be high in any case, and is not expected to exceed an average of £10 per acre for green timber, and a good deal less if the trees have been killed for a couple of years. During the wet season, when the soils readily yield, economy in this direction will be obtained by the use of tree-pulling machinery.

TOBACCO PRODUCTION.

The combination of an ideal climate, faultless soil with a suitable rainfall, indicates the district of Mareeba as eminently adapted for the production of high-grade tobacco leaf. While seasons of light rainfall occur as in other parts of the State, an insufficiency to secure a crop is regarded as extremely unlikely.

Weight of Crop.—The return of cured leaf per acre can be expected to vary according to season, soil, and the variety grown. Taking a standard variety, such as Hickory Pryor, which has proved eminently adapted, the yields in a normal season may be expected to range from 450 lb. to 750 lb. on soils suggested as most suitable, the average yield of 600 lb. per acre being regarded as probable.

Value of Crop.—When properly grown and cured the lighter crops almost invariably yield larger percentages of the highest grades of leaf. With a present protective tariff of 3s. 6d. per lb., the value of superfine leaf would command a price approaching 5s. per lb., while all leaf graded bright would bring not less than 3s. per lb. As results up to the present have indicated a production of at least 80 per cent. of bright colour within these yields, it might be safe to calculate on an average return of 3s. 6d. per lb.

Assuming, however, that an average crop would be 500 lb. and that the average price was 2s. 6d. per lb., which is a most conservative estimate, the yield would be £62 10s. per acre; at an average of 3s. it would be £75, and at an average of 3s. 6d., the sum of £87 10s. per acre would be obtained.

Cost of Production.—An estimate of the cost of production in the United States published some four years ago was stated to be £27 1s. 8d. per acre.

Allowing for less skilled labour, and making provision for depreciation of buildings, &c., the maximum cost of production in North Queensland should not exceed an amount of £35 per acre, but be somewhat lower.

Profit on Growing.—Allowing cost of production at £35 per acre and gross return at the lowest estimate of £62 10s., the net profit would be £27 10s. per acre, which is very considerably more than the average net return secured with an acre of any other crop at present grown commercially.

Times of Planting.—The most suitable time for transplanting from seed-bed to field is suggested as from mid-December to mid-January, or shortly after the first heavy falls of rain occur in the wet season. This will necessitate the sowing of the seed-beds between the first and third weeks of November.

It takes usually from seven to ten days for tobacco seed to germinate, and it is considered inadvisable to set out in the field plants older than eight weeks, those four to six weeks old being most desirable.

Harvest of Leaf.—The tobacco leaf should ripen through March and April, and, in general, be all cured by May.

Marketing.—Bulking and grading operations may be expected to occupy attention through May, June, and July, allowing market to be completed in the month of August.

Value of Other Crops.—Except with tobacco, commercial success is not considered possible with crops climatically suited to the district, since the cost of fertilisers necessary for growth on the poor soil, coupled with an expected low return and the small prices to be expected, would allow any net profit secured to be insufficient to provide a reasonable living.

As rotative crops, however, from which the tobacco crop will benefit, the growth of sorghum varieties, which includes broom millet, velvet beans and cowpeas for seed, sweet potatoes, and cotton are suggested as practicable.

TOBACCO GROWING IN NORTH QUEENSLAND.

CONDITIONS OF SETTLEMENT.

IN the course of a recent announcement, the Minister for Agriculture and Stock, Mr. Harry F. Walker, said that the scheme adopted by the Government to stimulate the production of bright tobacco leaf in North Queensland provides for the opening up of twenty-five portions of land in the Mareeba district for selection under the group system as agricultural homesteads, the purchase price being 2s. 6d. an acre, payable in annual instalments of 3d. per acre over a period of ten years, when a freehold title will be available; or such may be obtained at the expiration of the first five years (during which personal residence is obligatory) by paying the balance. Under the Act, improvements to the value of a fence around the block must be effected within the first five years.

In order to ensure the cropping of 5 acres this coming season with tobacco, since there would be insufficient time after occupation is effected for the selector to do so, Mr. Walker said he had arranged with the Minister for Labour and Industry, Mr. Sizer, that such an area on each portion should be grubbed, cleared, and ploughed, the work of grubbing and clearing to be carried out by local unemployed under the relief scheme, and the ploughing by contract, after tenders had been invited.

It was also decided that the young tobacco plants necessary to plant up each 5 acres should be raised in community seed beds, under the supervision of an officer of the Department of Agriculture, who would also be deputed to locate the site for the 5 acres of cultivation on each farm, and to see that its preparation was satisfactorily accomplished.

The Main Roads Commission is to provide all equipment, in camp gear, tools, &c., and officers to control the work in co-operation with the representative of the Department of Agriculture. The initial expenditure will be charged to the unemployed relief fund, which will later be recouped by payments from the selectors concerned, spread over a term of years, for the actual cost of the grubbing and clearing, if such does not exceed £12 an acre, and, at the rate of £1 per 1,000, for the plants obtained. It is not thought that an average amount of £12 for grubbing, clearing, and ploughing each acre will be exceeded, but, if it is, any excess will be borne by the unemployed relief fund, and not charged to the selector.

In the contract to be signed, provision is made for the ploughing to closely follow the clearing, so that both operations will be concluded by the middle of November at latest.

Early last month fifty unemployed workers, in local centres, were transported to the job, camps fixed, the necessary tools provided, and the work commenced.

It is understood, from the number of inquiries in hand, that applications in excess of the number required will be made for the portions available, in which case allotment will be made in the usual way by ballot.

As applications will be received up to 14th October, it is expected, allotment and notification of successful applicants being made immediately thereafter, that occupation will take effect about the first week in November.

The first job of the settler will be to make a camp, after which he should go on with fencing and securing necessary tools and implements, as well as horses or other tractive power.

Very shortly after this, the erection of the flue-curing barn and bulk shed should be undertaken. Though harvesting operations will not be commenced until March, it will be a wise plan to have all necessary buildings erected in good time. Plans and specifications of these buildings will shortly be available from the Department of Agriculture.

As most of the settlers will have little or no experience of tobacco, it has been arranged that officers of the Department of Agriculture will be available to supervise all cultural operations and be on hand to give instruction in harvesting, curing, and subsequent operations, until the leaf is sent away for sale.

TOBACCO SEED BEDS.

By N. A. R. POLLOCK, H.D.A., Senior Instructor in Agriculture.

THE production of strong, healthy plants, free from disease and insect infestation, that will most easily bear transplanting to the field and there make satisfactory growth, is a prime factor in successful tobacco-leaf production. Not only will such plants make better growth and reach a more even maturity, but they will, through their unimpaired vigour, offer a greater resistance to attack by disease than would others less well grown.

Soil.

A tobacco seed, being exceedingly small, can provide but a small amount of nourishment for the young seedling, which in consequence is soon forced to draw its food from the soil. A friable fertile soil of fine texture, with a good humus content and capable of easy reduction to a fine tilth, should therefore be selected for the seed beds. A sandy silt loam, or a fine textured alluvial, or other loam, is considered very suitable.

Where such a soil is not available on the holding, the existing soil can be built up by the addition of fine sand or heavy soil, whichever is called for, to improve the texture, and by the addition of well-rotted organic matter, either as leaf mould or animal manure, or both, to improve both texture and fertility. The manure, if used, should be well dug in some time before the seed beds are required in order to become thoroughly incorporated with the soil.

Drainage.

Good drainage is imperative for tobacco seed beds, since the seedling plants will not make a satisfactory growth on wet soil, and will also be liable to damage from fungus diseases so engendered.

Site.

The situation of the seed beds should be as sheltered as possible from strong winds, which are apt to damage the coverings (alluded to later on) and to dry out the soil. It should be such as to allow of easy drainage, if it is not naturally provided, and convenient for ease of access and attention. Proximity to a permanent supply of water is of the utmost importance. Tree growths should not be close enough to cast their shade on the beds or, through their roots, to rob them of food or moisture.

Area.

In calculating the area of seed bed required, though it is usual to allow 100 square feet as sufficient for each of the acres it is intended to plant, a surplus of 50 per cent. is considered advisable to allow for eventualities.

It is also advisable to make two sowings at intervals of two or three weeks in case sufficient rain does not fall to allow of setting out the first raised plants before they are too old. It is considered inadvisable to set out in the field plants that are older than eight weeks; plants four to six weeks old are much to be preferred.

Size.

The seed beds may be formed to any desired length, but they should not be of greater width than will allow ease of weeding or of lifting plants preparatory to transplanting. A satisfactory width for such purpose is 3 feet, with a distance of 2 feet between beds to make provision for pathways. The width of 3 feet corresponds with the width of butter muslin or cheese cloth, which material is regarded as very suitable for covering purposes.

Preparation.

The land, having been first cleared of all surface growth, should be thoroughly pulverised by ploughing or spading to a depth of 5 or 6 inches and brought to a fine tilth. The seed beds should now be marked out by drawing drills at intervals of 5 feet, to make the breadth of beds, and across these again for the lengths desired.

These drills should be the depth of the ploughing and approximately 18 inches wide, the soil therefrom being thrown back and spread over the beds thus formed. A double mould-board plough is very suitable, or an ordinary plough may be used. The beds will thus be 3 feet 6 inches wide, which will allow of the framework, enclosing the 3 feet to be seeded, resting thereon.

Sterilising.

Before further preparing the seed beds for sowing, the soil should be sterilised. There are several methods of doing this—viz: by steaming, applying boiling water, solutions of formalin or similar agents, but the most effective in general estimation, and recommended for Queensland growers, is the application of direct heat from the firing of tree branches, brushwood, or similar heat-giving material piled on the beds to such an extent as will, when fired, produce sufficient heat in the soil to cook a 4-oz. potato buried 3 inches deep or an egg buried 5 inches deep. It is difficult to state the exact amount of material for burning purposes, but the equivalent of poles 3 inches in diameter laid side by side is regarded as likely to prove satisfactory. Successful sterilisation of the soil is most readily accomplished when the amount of moisture therein is what is regarded as satisfactory for cultural operations. Excess of moisture is as undesirable as a deficiency, since in either case the penetration of the desired heat in the soil is less easily permitted.

Properly burnt beds show a more or less reddish tinge of colour, while the soil is rendered more friable and breaks easily to a fine powder. The object of burning the beds as well as the soil for a couple of feet surrounding them is to destroy any fungus spores, weed seeds, insects, or other life that may cause damage to the young plants.

Another effect of burning the soil is to render the nitrogen content more readily available. The addition of the ash from the material burnt also tends to increase fertility.

Time to Burn.

The time to burn the seed beds is preferably a few days or a week before it is desired to sow the seed.

Final Preparation.

After the fire has burnt out and the soil is sufficiently cool, all unburnt pieces of wood and large charcoal should be removed and the beds and paths (disarranged when placing the firing material thereon) trimmed up to proper shape. The fine ashes from the firing should now be thoroughly incorporated with the soil of the seed beds, which at the same time should be reduced to the desired degree of fineness by digging and raking back and forth to a depth of 3 inches and finally levelled off.

Framework.

It is necessary for tobacco seed beds, more especially in North Queensland, to be shaded when the seed is germinating, as the heat from the direct rays of the sun is apt to scorch the young seedlings; it is also advisable for the beds to be protected against the ingress of insects which would be likely to cause damage. To get this effect satisfactorily and to allow of the covering used for shading not interfering with the growth of the plants, a frame or box with sides 6 or 7 inches high should enclose the beds. A suitable frame can be made of boards 6 or 8 inches wide; the ends of these should be squared so as to fit closely at the joins, over which a short piece of board or sheet iron could be nailed at the corners, when the boards should be nailed to each other and further protection afforded by sheet tin, such as a piece of a petrol tin, fixed to enclose the right-angle so formed.

The top of the frame should be even so that the covering will fit closely, and the boards should be sunk an inch or so in the soil and the soil on the outside heaped against them.

Protection against the ingress of insects is regarded as most important, since the setting out of plants in the field free of infestation, either in the form of eggs or larvæ, must be regarded as a distinct advantage. Other types of framework can be considered for use, but the main essential to be observed, while allowing for support of the shading, is to have them so constructed as to allow insufficient space for the entrance of even very small insects when the covering for shade is applied. The breadth of the framework should be commensurate with the width of the covering material used so as to allow ease of attachment. With material a yard in width a breadth of 3 feet overall is suggested as a limit.

Covering.

Provision for sufficient light and the circulation of air in the seed bed is necessary for the successful growth of plants. Choice of material for covering, especially in North Queensland, suggests consideration being given not only to a protection against the direct rays of the sun, which at the time of seeding is vertically overhead, or nearly so, at midday, but against rain storms likely to occur while the plants are being raised, which would tend to damage the young plants or to wash them out. Glass is probably the most effective all-round covering, but would require to be shaded during the hottest part of the day. The initial cost in the first instance would be considerable, but where operations are on an extended scale it will be likely to prove most economical over a period of years.

Cheese cloth or butter muslin, purchasable at small cost, secured across the framework usually makes a very satisfactory covering, but can be further improved by the addition of hessian, calico, or canvas placed tentwise or with sufficient pitch to run off heavy rain a little distance above.

When placing the covering of whatever material on the frames, provision should be made for its easy removal when watering or otherwise attending to the plants. Loops of tape sewn to the edges of the material to slip over nails or hooks on the outside of the frame with wires drawn taut or supported at intervals across or along the beds to prevent sagging will be effective, but perhaps the most satisfactory will be to attach the material to the underside of pieces of lath placed at intervals across the breadth of the frame with one at each end overhanging to keep the material stretched; the covering can thus be conveniently lifted or rolled back and as easily replaced.

Fertilising Seed Beds.

When the soil is of low fertility, or it has not been practicable to enrich it by the previous addition of manure, the application of a little fertiliser is suggested. In this connection it would be advisable to make use of a complete fertiliser, of which a suitable mixture would be 6 parts superphosphate, 3 parts of nitrate of soda or dried blood, and 1 part of sulphate of potash, applied at the rate of 1½ oz. per square yard of seed bed.

Where the beds have been burnt, however, there should be sufficient potash supplied in the ash from the firing, when a satisfactory application will be superphosphate at the rate of 1 oz. or a heaped tablespoonful evenly dusted over every square yard. Nitrate of soda could be added at the rate of ½ an oz. per square yard, or applied in solution by a watering can. Fertiliser should preferably be applied the day before sowing and brushed rather than raked into the surface of the soil.

Rate of Seeding.

Tobacco seeds being so small induce a tendency to sow too heavily. An ounce by weight will contain approximately 300,000 seeds, which quantity will fill a teaspoon to its level twelve times. A level teaspoon will thus contain about 25,000 seeds, which quantity is regarded as ample for 100 square feet of seed bed, unless the seed is known to be of low vitality. A heavy seeding results in a crowding of plants, which consequently make a spindly growth; another bad feature is that such crowding prevents the access of air and light to the soil, thus inducing the production of fungus diseases.

Time to Sow.

The time for sowing the seed beds will be regulated by a knowledge of the seasonal conditions usual in the district, the object being to have plants four or six weeks old when sufficient rain has fallen to ensure growth after transplanting. The best quality of leaf is grown during the warmest months of the year.

In North Queensland, where the rainy season usually commences in December, it is advisable to make sowings in the second and fourth weeks of November. It takes from seven to ten days usually for the seed to germinate; old seed sometimes takes up to fourteen days or longer. Seed thus sown can be expected to provide plants for setting out from mid-December to mid-January.

Sowing.

It is probable that the soil at the time it is desired to sow the seed bed will be rather dry; if this is the case a good watering is indicated a day or so before the seed is sown, since a heavy application immediately afterwards is not desirable.

When the moisture content is satisfactory the surface soil should be broken finely and then slightly compacted, as by the pressure of a board, to present an even and level appearance. To secure an even distribution of the seed over the seed bed will be extremely difficult unless some medium is used. In South Africa success is reported by distributing the seed, suspended in water by agitation, from a watering can with a fine rose. The usual method, however, is to mix the seed very thoroughly with fine dry sifted ashes, using a quart or more to that for each 100 square feet. In mixing, it is advised to take a bucket or similar receptacle and place a layer of ashes in the bottom, then sprinkle a pinch of seed over it, then another layer of ashes followed by a pinch of seed until the desired amount has been used up. The ashes and seed should now be thoroughly mixed by hand, and then poured from one bucket into another several times. By broadcasting this mixture over the bed the colour of the ashes will give an indication of the evenness of distribution. After the seed is thus sown it should be lightly pressed into the soil. This is performed by the use of a board, to the centre of which a handle has been vertically fixed. Some growers prefer to add a mulch after sowing; for this, dried and finely teased horse dung is very suitable, as it forms a mat over the soil which prevents disturbance of the seed when watering and is easily penetrated by the young seedling. It is advisable, however, in preventing the introduction of weed seeds or fungus spores, to sterilise this material by contact with boiling water or steam for ten minutes or so. Tobacco seed should not be covered too deeply, as germination will thereby be retarded if not prohibited; consequently any form of mulch used to cover must be in a very thin layer.

Watering.

Immediately after seeding the beds should be lightly and evenly watered and kept damp, but not wet, whilst under shade. A watering can with a finely perforated rose can be used, but a hose with a nozzle capable of giving a fine spray under pressure such as would be obtained with water laid on from an overhead tank would be more satisfactory.

The frequency of waterings will to an extent be regulated by the evaporation, but a light watering in early morning and late evening is preferable to a heavier watering once a day. When the seed has germinated and the plants have made some growth the watering can be effected more rapidly by using a rose with larger perforations on the watering-can or hose.

Hardening Off.

Plants grown entirely under shade would be too tender to withstand the shock of transplanting to the field, where bright sunshine would prevail; they should, therefore, be gradually hardened off by removing the covering when they are an inch to and inch and a-half high for an hour or two in early morning and late afternoon, gradually extending the period until they will bear the direct sunlight all day. The covering, however, should always be on the beds through the night or between sunset and sunrise, as most predatory insects on tobacco plants are night

fliers. When the plants are half grown the waterings should be lighter, but not enough to allow of the plants wilting.

Added Precautions.

As a preventive against fungus diseases the young plants can be sprayed with Bordeaux or Burgundy mixture, diluted to three-quarters the usual strength, to which might be added arsenate of lead, especially if grasshoppers are in evidence, as a protection also against insect attack. A spraying with arsenate of lead or Paris green the day before the plants are lifted for setting out in the field will afford a further protection, and is recommended.

Should the plants not be making satisfactory progress in the seed bed, or if it be necessary to accelerate their growth, the application of a liquid manure is advisable. This can be prepared by half filling a cask or similar vessel with cow, horse, or fowl dung, the last named being regarded as the best, and then filling up with water. After a few days, during which the contents should be stirred occasionally, the liquid can be used when diluted with nine or ten times its bulk of water to moisten the beds.

POINTS IN FALLOWING.

As the essence of fallowing is the storage in the soil of moisture precipitated before the seed is sown so that it may supplement that which falls during the growth of the plant, the time of the year at which the plough should be put in must be governed largely by the incidence of the rainfall. For the winter or ordinary fallow the initial ploughing or cultivation should be carried out not later than October in the year previous to sowing. Farmers employing this system of fallowing who have not yet performed the initial operation may be reminded of the following points:—

Ploughing should take place when the soil is neither too wet nor too dry. Sufficient moisture should be present to make it crumbly, so that it will not turn over in heavy, dry clods. If, on the other hand, the soil is too wet, ploughing will destroy its physical condition and it will dry out in hard lumps, from which state it will be very difficult to get it back into a good, free condition.

One of the objects of fallowing is the production of a suitable seed-bed, and this must be kept in view throughout the whole of the cultural operations that precede sowing if success in this direction is to be obtained. Even in connection with the first ploughing it must be considered. Though over the major portion of the wheat-growing area it is desirable to invert completely the top 4 to 5 inches of soil when ploughing the fallow to bury weed growth and admit air and moisture to the soil, the depth of ploughing should be regulated according to the nature of the soil, the rainfall of the district, and the time of ploughing. Turning up of sour subsoil should be avoided. On some types of soil it is very difficult to secure consolidation if the ploughing is deep because of the impossibility of obtaining compactness except in seasons of ample rainfall, and excellent fallows can be prepared on these by not ploughing more often than every two or three years. As rain is the most effective agent in compacting the soil, it follows that the less rain that is likely to fall on the fallow the more shallow should be the ploughing; therefore, in the case of districts of limited rainfall it is advisable to plough shallow; so, too, when the fallow is not ploughed sufficiently early. Farmers should be careful not to plough too many years at the same depth, as such a procedure is liable to result in the formation of a hard-pan. An occasional variation of, say, half an inch in depth will prevent this.

If the ploughing in one season is from north to south, it is advisable that the following year it should be from east to west, in order that the formation of deep furrows may be prevented. Many farmers for convenience plough the paddock round and round, but it is certainly a better method to plough in lands.

Much controversy exists among farmers as to whether the mouldboard or the disc plough is the better implement for the purpose. No hard-and-fast rule can be laid down, and the farmer must be guided to a large extent by the class of soil he has to handle and the condition it is in when making a choice between the two implements.

The mouldboard plough may be said to do better work in land that is likely to break up too fine, and is certainly superior to the disc on land covered heavily with weeds or other rubbish. On the other hand, the disc plough on fairly clean land has many advantages, chief of which is that from 400 to 500 acres can be ploughed with the one set of discs without renewing them. However, a great deal less depends upon whether the land has been ploughed with a disc or mouldboard plough than upon the choice of the right time, and the thoroughness with which the work is done.

DAIRY CATTLE AT THE BRISBANE SHOW.

The high standards attained by Queensland dairy cattle breeders were manifested impressively at the recent Brisbane Show, as may be judged from the accompanying camera record.

This interesting collection of Show ring favourites is presented through the courtesy of "The Queensland Dairy Farmer."

CARNATION LUCY'S LOCKET (4531), by Carnation Prince (1055); dam, Carnation Lucy (2277). First aged Jersey cow, in milk, and Reserve Champion. Bred and owned by W. Spresser and Son, Brassall, Ipswich.

TRINITY HAZELETTE (3841), by Ginger Duke (1276); dam, Oxford Hazel (2120). One of the fine team bred and exhibited by Mr. J. Sinnamon, Trinity, Goodna, Q.

DUCHESS OF CALTON (2080), by Clair Val Hero (imp., 695); dam, Trinity Montrose (App). First in Jersey butterfat test with 59.75 lb. milk and 2.660 fat in 24 hours. Bred and owned by John Collins, Tingoora.

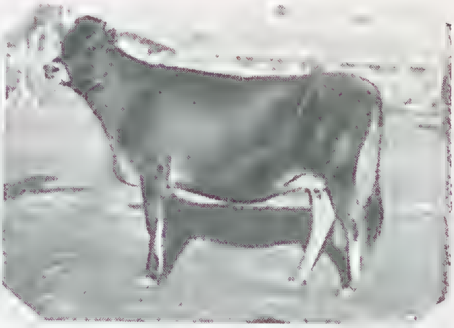
BELLEFAIRE SATISFACTION'S BELLE APPIN, by Werribee Prince Twylish; dam, Werribee Master's Satisfaction 2nd. A recent purchase from the South exhibited by Mr. A. S. Markwell, Beaudesert. She was just out of a place in the 18 months class.

QUEENIE OF CHELSFORD (7290), by Zenobia's Mascot of Woodstock (2653); dam, Sweet Clare of Chelsford (4426). Exhibited in yearling class by G. A. Ferguson, Woodhill. She was Champion at Beaudesert, 1930.

CARLYLE LARKSPUR 14th (7220), by Carlyle Woodside Flores (2869); dam, Carlyle Larkspur (1994). Fourth in the yearling heifer class. Bred and owned by W. and D. Carr, Indooroopilly.

PLATE 114.

TRINITY MEADOWSWEET (7063), by Ginger Duke (1276); dam, Trinity Sunset (3845). Third in yearling heifer class. Bred and owned by J. Sinnamon, Goodna, Queensland.



BELLEVUE AILSA (8230), by Goldfinder (imp., 765); dam, Violet Angler of Bellevue (10881). A two-year-old heifer exhibited by Mr. W. E. O. Meiers, Rosevale, Rosewood.

PRIDE'S CRYSTAL OF BURNLEIGH (7810), by Trinity Darby (1720); dam, Sultane's Pride of Burnleigh (3135). Exhibited in yearling, in milk class, by W. W. Mallett, Nambour.

GLENVIEW HOLLY, by Carlyle Larkspur 2nd's Empire (1590); dam, Dolly 2nd of Sunnymeade (3263). Second for heifer, twelve and under eighteen months, dry. Bred and owned by F. P. Fowler and Son, Biggenden.

PINEVIEW JEWEL (8173), by Oxford Buttercup's Noble (2899); dam, Pineview Princess (4654). Bred and exhibited in the yearling, in milk, class by Messrs. J. Hunter and Sons, Borallon, Q.

OXFORD DIANTHUS (8506), by Oxford Renown (2257); dam, Oxford Daffodil (6497). First for heifer, 18 months and under two years, dry. Bred and owned by E. Burton and Sons, Wanora, Q.

Plate 115.

CARNATION FAIRY FLY (6488), by Carnation Bright Star (2734); dam, Carnation Butterfly (3598). First prize heifer, two years old, in milk. Bred and owned by W. Spresser and Sons, Brassall, Ipswich.

PRINCESS OF ARRANMORE (7166), by Trinity Prince of Wales (2262); dam, Hope 969). Fourth for two-year-old heifer, dry. Bred and owned by A. S. Markwell, Beaudesert.

COLLEGE PRINCESS PONTIAC (1839); by Pabst Pontiac Blue Star (imp., 254349); dam, College Prima Donna (736). First and Champion Friesian cow (1929 and 1930), and first in Friesian butterfat with 80 lb. milk and 2.843 lb. fat in 24 hours. Owned by Hickey and Sons, Wilston.

INAVALE LADY 2nd, by Anama Dirkje's Pride (549); dam, Inavale Lady (2486). First prize Friesian two-year-old, dry. Bred and owned by C. Behrendorff, Boonah, Q.

ST. ATHAN ALMOND 3rd (3224), by Colossus of St. Athan (458); dam, St. Athan Almond (2304). First for Friesian cow, three years and under four, dry. Owned by D. Young and Sons, Kingaroy.

BURNBRAE GELSCHI FOBES, by St. Alban's North Star (1087); dam, Geneva of St. Athan (1267). Third in heifer, 18 months to two years, dry. Bred and owned by R. S. Alexander, Toogoolawah.

PLATE 116.

SHIELD 2nd of INAVALE (3125), by Duke of Brussels of Berry (63); dam, Shield of Inavale (229). First prize aged dry cow. Owned by D. Young and Sons, Kingaroy, Q.

BONNIE WILLIE 2nd OF LONGLANDS (6874), by Longlands Bonnie Willie (6873); dam, Longlands Tina 5th (18542). First and Champion Ayrshire bull. Owned by J. H. and R. M. Anderson, Southbrook, Q.

FAIRVIEW LADY JEAN (17888), by Crescent Farm Beryl's Jock (6629); dam, Fairview Jean 2nd (17878). First for three-year-old, in milk, and Champion Ayrshire cow. Bred and owned by J. H. and R. M. Anderson, Southbrook, Q.

TRINITY DARBY (1720), by Lord Ettrey of Banyule (1277); dam, Fern's Crystal (imp., 1332). First and Champion for the third time at Brisbane. Owned by W. W. Mallett, Nambour, Q.

TRECARNE GOLDEN KING (3030), by Carnation Royal Scot (1890); dam, Trecarne Duchess (5266). First prize three-year-old and Reserve Champion Jersey bull. Bred and owned by T. A. Petherick, Lockyer.

TRINITY PRINCE OF WALES (2262), by Ginger Duke (1276); dam, Oxford Hazel (2120). Second in aged bull class. Owned by Mr. A. S. Markwell, Beaudesert.

Plate 117.

WOODSIDE VASILIKA'S VOLUNTEER (3628), by Speedwell's Volunteer (imp., 3625); dam, Vasilika 7th of Woodside (20131). Second in three-year-old class. Owned by W. and D. Carr, Indooroopilly.

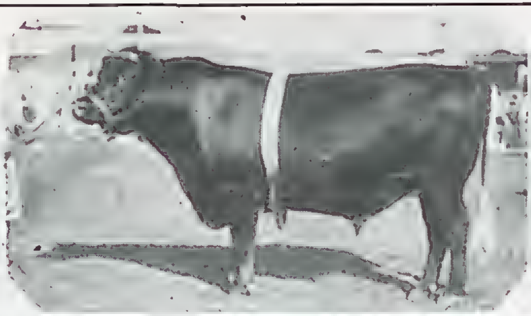
MONTROSE GIPSY OF GLEN IRIS (2227), by Montrose Sultan (imp., 2624); dam, Gipsy Love of Woodside (11257). Exhibited in aged class and sold by V. Goodger to R. J. Crawford, Inverlaw, Kingaroy, Q.

TRECARNE FERN LAD (3674), by Trecarne Sultan (2887); dam, Ginger's Fern of Brooklands (2470). Third in class for bull, two years old and under three years. Owned by W. H. Baulch, Forest Hill.

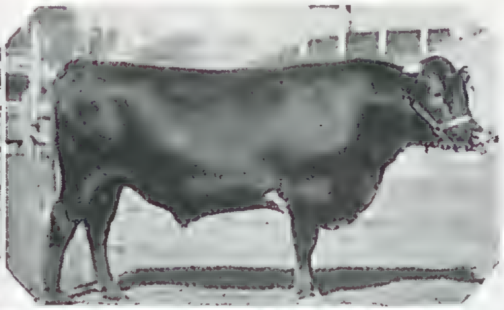
TRINITY OFFICER (1513), by Ginger Duke (1276); dam, Oxford Hazel (2120). Third in class for Jersey bull, four years old and over. Owned by F. P. Fowler and Sons, Biggenden, Q.

PLATE 118.

DAPHNE'S ROYAL OF HILLVIEW (1129), by Gay Lad 2nd of Burradale (533); dam, Daphne 2nd of Hillview (3423). First and Champion A.I.S. bull. Owned by F. O. Hayter, Pomona, Q.



LIMELIGHT OF GULVALLIS (1254), by Royal Oak 3rd of Nestles (54); dam, Red Duchess 3rd of Nestles (901). Second and Reserve Champion A.I.S. bull. Owned by C. F. Francis, Merton Hall, Biarra, Q.



RENOWN OF MOUNTAIN HOME (1641), by Goldstream of Greyleigh (515); dam, Countess 4th of The Cedars (3872). First prize A.I.S. bull, two and under three years. Owned by J. A. Montgomery, Laidley, Q.

LORNA'S GENERAL OF ARLEY (271), by Cinderella's Recruit of Greyleigh (348); dam, Lorna of Arley (50). Fourth prize aged A.I.S. bull. Owned by A. C. Stewart, Wolvi, via Kin Kin.

LIMELIGHT OF RALEIGH (2120), by Royal Standard of Darbalara (2908); dam, Ethel 5th of Raleigh (13583). Second for A.I.S. bull, two and under three years. Owned by Messrs. Caswell and Franklin, Wangalpong, Q.

GUARDSMAN OF DARBALARA (1644), by Climax of Darbalara (899); dam, Melba 25th of Darbalara (10068). Purchased by Macfarlane Bros., Radford, from D. Dunn, Beaudesert, at 65 guineas.

PLATE 119.

YOUNG COMMODORE OF SPRINGDALE (1218), by Lovely's Commodore of Burradale (495); dam, Princess of Springdale (533). Head of winning sire's progeny stakes group. Owned by Hickey and Sons, Wilston.

MAJOR OF BLACKLANDS, by Red Prince of Blacklands (1064); dam, Jean 6th of Blacklands (239). First for A.I.S. bull, 18 months to two years. Bred and owned by A. Pickels, Blacklands, Wondai.

KIA-ORA OF SUNNYVIEW, by Jellicoe of Headlands (1315); dam, Scarlet of Forest Grove (12102). First prize A.I.S. bull calf, and sold by Mr. J. Phillips to Mr. B. C. Tuckett, of Brookfield, at the record price of 175 guineas.

HEADLIGHT OF FAIRFIELD, by Jellicoe of Fairfield (1136); dam, Linda 3rd of Fairfield (9420). Second prize A.I.S. bull, 18 months to two years old. Owned by V. Dunstan, Wolvi, Kin Kin, Q.

MIDGET SHIEK OF WESTBROOK (1511), by Shiek of Upton (934); dam, Midget of Westbrook (821). Fourth prize A.I.S. bull, two and under three years. Owned by Con. O'Sullivan, Greenmount.

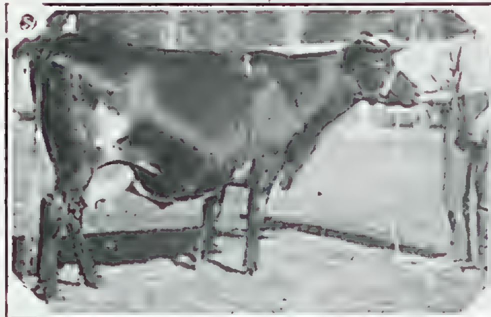
JOHN BULL OF GREYLEIGH (1428), by Bosca of Greyleigh (205); dam, Linda 4th of Greyleigh (7999). Second prize A.I.S. bull three and under four years, and sold for 50 guineas by A. I. Titmarsh to W. A. Buchanan, Morayfield, Q.

Plate 120.

MYRTLE 4th OF LEMON GROVE (8042), by Dan of Greyleigh (97); dam, Myrtle 3rd of Lemon Grove (6489). First and Champion A.I.S. cow, and second in butterfat class with 73.1 lb. milk and 2.532 lb. fat in 24 hours. Owned by J. Phillips, Wondai, Q.

DIANA 11th OF KELSTON (8365), by First Warrior of The Cedars (279); dam, Diana 7th of Jinbiggaree (273). First in A.I.S. butterfat class with 67.5 lb. milk and 3.007 lb. fat in 24 hours. Owned by A. Frank, Boonah.

SUSIE 4th OF HILLFIELD (11895), by Robin of Brooklyn Terrace (1354); dam, Susie of Hillfield (8367). First A.I.S. cow, three and under four, in milk, and second in three-year-old butterfat class with 109.8 lb. milk and 4.3480 lb. fat in 48 hours. Owned by S. J. Lester, Laidley.



POLLY 5th OF SPRINGDALE (2986), by Plum's Boy of Greyleigh (480); dam, Polly 4th of Springdale (3414). Second in aged dry A.I.S. cow class. Owned by V. Dunstan, Wolvi, Q.

DAHLIA 7th OF SPRINGDALE, by Emperor of Springdale (811); dam, Dahlia 3rd of Springdale (853). Second A.I.S. heifer, two and under three, dry. Owned by A. J. Caswell, Wangalpong, Q.

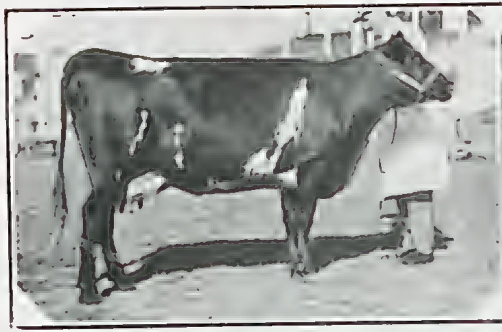
DIANA 17th OF KELSTON (14244), by First Warrior of The Cedars (279); dam, Diana 7th of Jinbiggaree (273). Fifth prize A.I.S. three-year-old, and present holder of Australian two-year-old production record. Owned by A. Frank, Boonah.

Plate 121.

QUEENIE 3rd OF GLENDALOUGH, by Don of Springdale (971); dam, Queenie 3rd of Pine View (2199). First A.I.S. heifer, 18 months to two years, in milk. Bred and owned by Hickey and Sons, Wilston.

DNALWON LUCKY STAR, by Limelight of Raleigh (2120); dam, Whinflower's Lucky of Dnalwon (5136). First A.I.S. heifer calf under 12 months. Bred and owned by A. J. Caswell, Wangalpong.

RUBY OF CORUNNA (5070), by Victor 2nd of Balmoral (237); dam, Champion 2nd of Corunna. Fifth A.I.S. cow, five years and over, in milk. Owned by Mrs. J. Handley, Murphy's Creek, Q.



MODESTY 2nd OF SUNNYMEADE, by Masterpiece of Oakdale; dam, Modesty 3rd of Dunmore. First prize A.I.S. cow, five years and over, dry. Bred and owned by Cowen Keys, Wondai.

TILLY 8th OF CEDAR GROVE, by Charmer of Cedar Grove; dam, Tilly of Cedar Grove (4240). First prize A.I.S. cow, three and under four, dry. Owned by Guppy Bros., Esk, Q.

STELLA OF BLACKLANDS, by Sultan of Blacklands (775); dam, Lady Primrose of Blacklands (7446). First A.I.S. heifer, two and under three, in milk, and third in heifer butterfat class with 102.3 lb. milk and 3.4334 lb. fat in 48 hours. Bred and owned by A. Pickels, Wondai.

PLATE 122.

Mr. Ben. O'Connor's fine pen of A.I.S. cows shown in the class for group of cows, three years old and over. On the extreme left is Rosette of Wilga Vale, champion butter-fat cow of Queensland.

Three of the females exhibited at the Brisbane Royal by Mr. V. Dunstan, of Wolvi, via Kin Kin. Although a comparatively new exhibitor at Brisbane, Mr. Dunstan was well among the ribbons with his fine team.

The preliminary line-up of the aged, in milk, class for A.I.S. On the extreme right is Rosette of Wilga Vale, one of the first cows stood up by Mr. Wills. The ultimate winner of the championship, Mr. J. Phillips' Myrtle 4th of Lemon Grove is third from the right, and in between the two of them is Mr. A. Pickels' Jean 6th of Blacklands.

PLATE 123.

Messrs. Hickey and Sons, of Wilston, Brisbane, put up a great display of Friesian and A.I.S. at the Brisbane Royal and took away their biggest collection of ribbons to date. On the left is Young Commodore of Springdale and two heifers which won the blue in the Sire's Progeny Stakes group, and on the right is the big group which won for them the Friesian Exhibitor's Group.

Plate 124.

Plate 125.—"Oxford Golden Buttercup" (Burton & Sons) Champion Jersey Cow, Brisbane Show, 1930.

Plate 126.—B. O'Connor's "Rosette of Wilga Vale," Champion Butter Fat Test Cow, Royal National Association Show, Brisbane, 1930.

PLATE 127.—TRINITY DARBY, CHAMPION JERSEY BULL. BRISBANE SHOW, 1930.

GROUND MILKING COMPETITION.

In the results of the Ground Milking Competition published in the September Journal, on page 293, the figures published of "Fussy 5th of Railway View" were incomplete. The complete official figures are as follows:—

——	Milk.	Fat.	Butter Fat.	Points.	Lact. Points.	Total.
	Lb.	Per cent.	Lb.			
A. T. Waters' Fussy V. of Railway View (A.I.S.)—						
Night	23·2	3·5	·812	. .	. .	. .
Morning	24·6	3·4	·8364	. .	. .	. .
Noon	21·0	5·1	1·071	. .	. .	. .
Night	21·3	3·5	.7455	. .	. .	. .
Morning	25·1	3·5	·8785	. .	. .	. .
Noon	18·3	4·4	·8052	. .	. .	. .
Total, 48 hours; average, 24 hours	133·5	. .	5·1486 2·5743	. . 41·19	. . 4·9	. . 46·09

THE ANGORA RABBIT.

Compiled by J. W. MUNRO, Department of Agriculture and Stock.

ANYONE intending to engage in fur and wool producing rabbit farming must bear in mind the conditions incidental to the issue of a license. Every keeper of rabbits must be licensed. Before a license will be issued enclosures must be erected, within which all rabbits must be maintained in accordance with the specifications as set down by the Department of Agriculture and Stock. Modifications of these specifications may be allowed where it is established that the materials necessary are unprocurable in the locality where the enclosures are to be erected; but in each instance the sanction of the Department must be first obtained. The license fees vary according to the number of rabbits to be kept, and the fees stipulated in the regulations cover the cost of inspection of the enclosures. Where negligence has been proved, and more than one inspection is necessary to ensure compliance with the official requirements, the extra cost involved in such additional inspections must be borne by the applicant. When the enclosures have been erected, an application, together with the necessary fee, should be lodged with the Department. An inspection will follow, and if the enclosures have been constructed to the satisfaction of the inspector a license will be issued.

Licensees must in each year, not later than the second week in January, make application for a renewal of their license, unless in the meantime they have, with the sanction of the Department, disposed of their rabbits.

Under no circumstances whatsoever must a rabbit be removed from an enclosure, either by way of gift or sale, without first obtaining the permission of the Department. Should a holder of these animals desire to sell any of the produce (stock) he must first make application for a dealer's license, the fee for which is £1 per annum or such other sum as may from time to time be declared by the Department.

Before a dealer delivers a rabbit to a prospective purchaser, he should impress upon the purchaser that he must erect the necessary enclosures and present his license to keep rabbits. Every sale effected must be immediately reported to the Department by the dealer.

Any contravention of the regulations renders the person or persons committing such breach liable to a penalty of £10.

Specifications and approved plans of suitable enclosures are appended.

Foundation of Hutchery.

Prospective purchasers should procure the very best stock obtainable for the foundation of their hutcheries.

Only recognised studs should be approached. Beware of speculators. The industry has suffered in other countries through speculators demanding exorbitant prices for inferior animals, and persons entering the industry with the erroneous assumption that a first-grade wool can be produced from such stock. By first consulting officers of the Department before purchasing, a good deal of trouble and worry may be obviated.

Housing.

By the time the rabbits are available for delivery, hygienic conditions should have been provided for their confinement. The hutches should be so constructed as to provide for easy removal of the droppings. The floor should be of ½-inch mesh netting wire stretched in such a way as to prevent sagging. Provision should be made immediately under the netting floor for a galvanised iron tray, easily removable for cleansing purposes. Wooden floors are out of the question, for they cannot be sufficiently cleansed to obviate unhealthy and objectionable odours.

Racks should be provided in the hutches for the holding of the greenstuffs, as well as a small box for the grain supply.

The construction of the hutch must permit of locking to ensure security of confinement of the animals.

As rabbits are purely hutch animals, the hutch is its home, and consequently hygienic conditions and comfort should be provided. Each hutch or compartment should be not less than 3 feet x 2 feet x 2 feet, and should be rat and mouse proof.

Feeding.

Rabbits are by nature vegetarians, consequently it must be remembered that their natural food is greenstuffs. If there is an abundance of this available it can be fed with safety in large quantities, thereby saving in the cost of grain. This is

an important factor in successful wool production for profit. Rabbits enjoy almost any green foods, and no other food compares with it for the development of the stock. The greenstuffs most relished by rabbits are thistle, lucerne, clover, chicory, pea vines, occasional sweet potatoe vines, and any grass that cattle will eat.

Hay being a bone-forming food should be available at all times, especially in the case of growing animals. Dry crusts of bread are invaluable to the breeding doe. During the winter months care should be exercised in seeing that frosted foods are not provided, thereby avoiding a considerable amount of trouble. In wet weather do not feed wet greenstuff, but lay it aside for drying without allowing it to become heated. In feeding, it is considered advisable to vary the class of feed supplied at each meal, thereby permitting the rabbit to balance its own ration. Roots suitable for winter feeding are artichokes in conjunction with hay, carrots, kohl rabbi, turnips, swede turnips, or an occasional beetroot.

The use of iodine is highly recommended and should be made up as follows:—Dissolve half an ounce of iodide of potassium in one and a-half pints of water. One teaspoon to a gallon of water is the recognised dose, or the same proportion in the water used to mix mash when mashes are fed to the animals. Iodine greatly improves the wool yield and is a deterrent to all forms of rabbit ailments.

A small handful of rolled oats is an excellent substitute for grain. The grains most suitable as a feed are crushed oats, rolled oats, flaked maize, dried brewer's grains, bran, and a few peas occasionally. A piece of rock salt should always be available as a lick. A plentiful supply of fresh drinking water should also be available.

Mating the Does.

Always place the doe in the buck's hutch—it is inadvisable to remove the buck from his own hutch for the purpose of mating. When the doe is ready for mating she generally lets you know by plucking herself and making a nest. Should the buck chase the doe around the hutch it is a certain indication that the doe is not in season and should be returned to her hutch until she is ready. A proper service is recognised by the doe raising her hindquarters and the buck falling over on his side. Watch for this, for if it does not happen it is sufficient proof that the doe is not in kindle. After the mating has been successful, the doe should be replaced in her hutch and left undisturbed.

Breeding.

Rabbits should never be mated until eight to nine months old, preferably at the latter age, when they have reached maturity. The gestation period is approximately thirty days. The actions of the doe vary according to temperament when the time for kindling arrives. Some does will prepare their nest two or three days before they are due, others perhaps only an hour or two. She should be assisted in her nest-building by making available ample supplies of soft hay. Should the doe fail to pluck herself, and kindle down with only the hay nest, cotton wool should be provided and a nest made for her. When the young arrive the nest should be examined, and if any stillborn or dead are found they should be removed immediately, otherwise the doe will eat them, and the probability is that she will kill the rest of her family and eat them also. On examining the nest it should be done very gently so as to avoid exciting the doe. Another point to be considered is in seeing that the doe is not overfat when kindling. For some unknown reason, in such cases the doe has eaten her young and left no trace behind her. The young when born are naked, blind, and deaf, and warmth is provided by the doe, who plucks herself and covers the young with her own wool. Ample supplies of water and green foods should be provided for the doe at this stage. The number in a litter varies, but a fair average is six. When this number is exceeded the surplus should be taken away, for it is generally considered that a doe can only satisfactorily nourish that number. Four litters per year are possible, but three is the number preferred by breeders who desire to give the doe every consideration. Avoid handling the kittens wherever possible.

Weaning.

At the age of five weeks the young are able to fend for themselves, and at this stage ample supplies of fresh green food should be available. During the first five weeks following birth they should be allowed to remain undisturbed with the doe. For the next three days the young should be separated from the doe for a period of two hours daily. For the following three days they should be removed from the doe during the whole of the day and only placed back with her at night. At this

stage they should be weaned and a definite separation effected. At the end of a further week, if the doe's condition is considered satisfactory, she may be again placed with the buck.

Diseases.

The provision of hygienic conditions in the maintenance of rabbits reduces to a minimum the possibility of contraction of disease. Cleanliness in feeding a variety of foods at regular intervals is essential to the health of the animals. Provide scope for as much exercise as the rabbit cares to take. Abundant supplies of drinking water should always be available.

Snuffles.—A serious and highly infectious cold, with sneezing and an offensive discharge from the nostrils. Isolate and disinfect the suffering animals. If not a valuable animal it should be destroyed. Oil of eucalyptus is sometimes beneficial, but it is only in rare cases that a cure can be effected.

Coccidiosis.—This is the worst disease known to affect young stock. It is highly infectious, and the source of infection is the droppings and dirty floors. It causes a very severe form of diarrhœa and plays havoc in the hutchery. Destroy all but valuable animals that become affected. Thoroughly disinfect the hutch from top to bottom with boiling water and carbolic acid. The parasite (coccidia) must be outside the host for a period of five days before reinfection can take place. Hutches should therefore be disinfected at intervals of five days.

Diarrhœa.—For this ailment, change the diet. If green food has been provided substitute it for hay and mash or boiled rice and milk. If green food has not been provided, do so. Charcoal often affords relief, and in most cases bread and milk is very helpful.

Constipation.—Lack of vivacity and loss of appetite are certain indications of this ailment. Vary the food and add a small quantity, say half an ounce, of cod liver oil to the mash. A teaspoon of castor oil will produce results.

Mange.—This is recognised by bare patches and scabs on the nose, lips, forehead, ears, and legs. Smear affected parts daily with equal parts of benzine and olive oil for a period of ten days. The result should be satisfactory.

Vaginal Catarrh.—In this ailment the vagina is swollen, showing a watery discharge. Thoroughly bathe the parts with a half per cent. solution of alum and water until trouble disappears.

Vent Disease.—This is discernible by inflammation and sores. Bathe with 2 to 3 per cent. lysol; wash daily and, after drying, smear with carbolised vaseline.

Sore Mouth.—This is generally the result of overgrown teeth. Place a fair-sized piece of wood in the hutch for the rabbit to nibble; this should remove the trouble. Pay particular attention to the mouth, as wool is apt to gather and mat around the teeth. When this occurs an extreme soreness of the mouth is created, and the resultant loss of appetite seriously impairs the condition of the animal.

Sore Eyes.—This ailment is generally caused by vapour of urine, which should be located and precaution taken against its possibility of remaining in the hutch on any future occasion. Dissolve boracic acid in water and drop into the eyes at frequent intervals during the day and wipe dry.

Sore Feet.—Sore feet are caused by rough or dirty floors. Supply soft hay for resting on, when the trouble will eventually disappear.

Grooming.

Where rabbits are satisfactorily housed grooming will be only necessary periodically, but where several animals are hutched together repeated grooming is essential to obviate matting of the wool. A long sharp-toothed comb is the best utensil, but care should be exercised in seeing that the skin is not lacerated whilst grooming. Any wool that is removed in grooming should not be destroyed, for in many cases it is of the best grade.

Shearing.

Round-pointed scissors are recommended for shearing, and where care has been exercised in grooming there should be no possibility of injury. This work should commence along the back, starting from the tail and shearing approximately a half inch from the body as far as the head. Proceed along the sides, but never remove the wool from the belly, breast, or legs in the case of breeding does. Avoid unnecessary crossing of the fibres when storing, and see that all particles of foodstuffs and hay are removed. For manufacturing purposes wool of 3-inch to 4-inch staple is best. Shorter lengths should be removed and kept separate. Plucking,

though satisfactory, is a much longer operation and does not increase the value of the wool. Grooming should be done immediately after shearing, as it is helpful in enabling the new growth to emerge. A first-class Angora is capable of producing 10 to 12 ounces of wool per annum. Never shear until the wool is at least 3½ inches long.

Features of the Angora.

Size and shape.—Round (snowball effect), not under 6 lb. in weight.

Front.—Full and prominent.

Head.—Short, broad at forehead, well tufted, with noble appearance. Wedge-shaped head with long ears signifies lack of type and should be discarded.

Ears.—Short and tufted.

Eyes.—Pink, with no discolouration of the whites.

Legs.—Straight with long furnishings of wool.

Condition.—Clean, healthy, and well groomed.

Wool.—Texture as silky as possible, evenly thick all over, and contour wavy. Straight, coarse wool of hair-like appearance should not show on good class stock. Such wool will not be accepted by manufacturers, notwithstanding any statement made to the contrary by salesmen.

APPENDICES.

1.—SPECIFICATIONS.

Specification "A."

The outer rabbit-proof enclosure shall consist of 60-inch rabbit-proof netting (6 inches in the ground and 4 feet 6 inches above the ground), the netting to be No. 17 gauge, 1¼-inch mesh, and to be attached to three plain galvanised No. 10 wires, one 18 inches, one 3 feet, and one 4 feet 6 inches above the ground respectively.

Two barbed wires to be provided, the first 3 inches above the netting and the second 3 inches above the first.

Sketches showing construction of enclosures as laid down in conditions governing the keeping of Angora, Chinchilla, and other approved types of hutch fur-bearing rabbits for the purposes of fur farming.

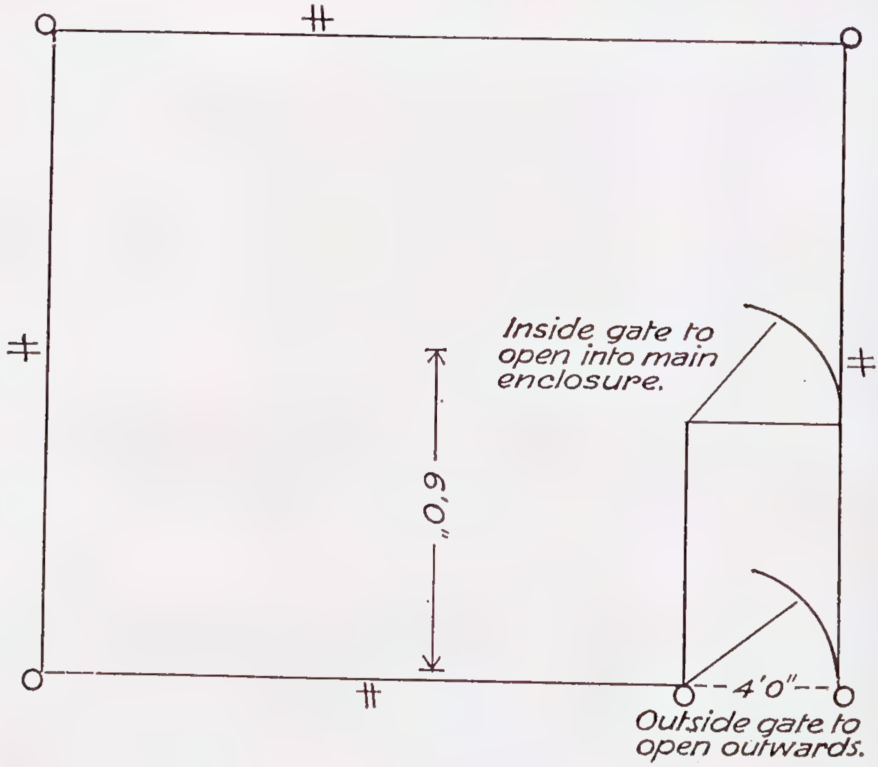


Plate 128 (Fig. 1).—When Rabbits are kept in Hutches

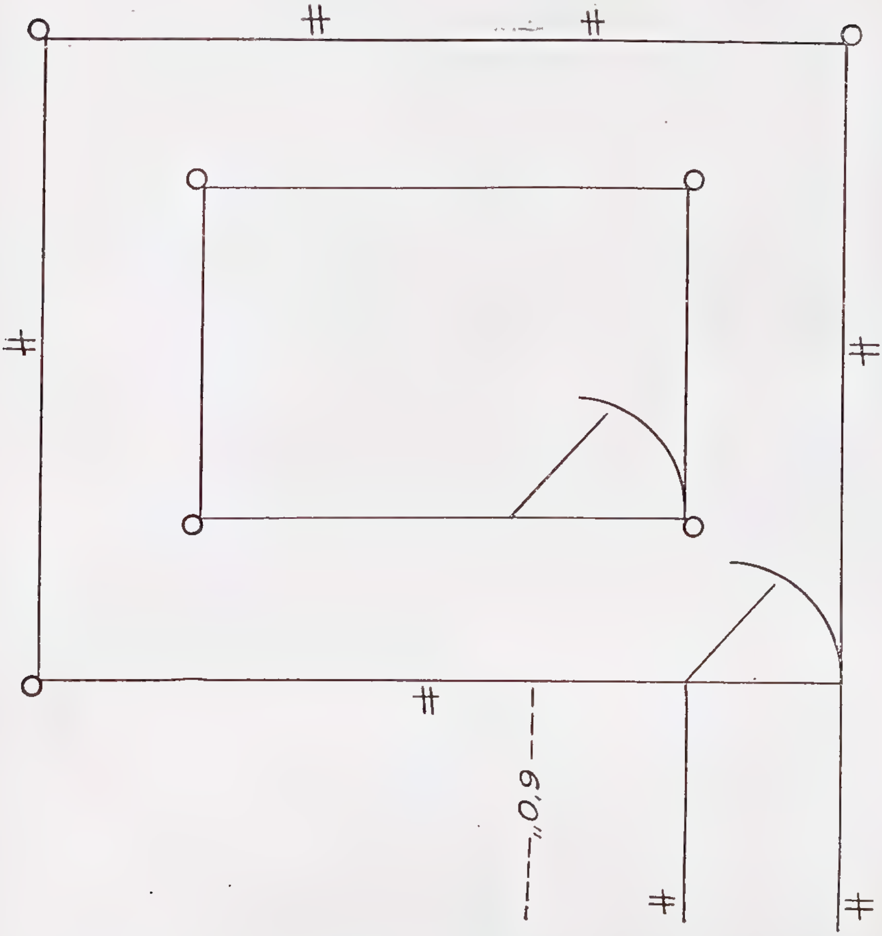


Plate 129 (Fig. 2).—When Rabbits are not kept in Hutches or only partly in Hutches.

Note.—Although the enclosed yard, 6 feet x 4 feet, is shown in Fig. 1 within the large enclosure to save material, it may be erected outside the large enclosure, as shown in Fig. 2, if the owner so desires, in either case. In Fig. 2 the distance between the fence of the outside enclosure and the inside enclosure is not to be taken as drawn to scale—that is to say, the distance between the two fences is a matter for decision by the owner.

The netting to be affixed to the inside of the posts, and any struts or other supports to be placed on the exterior of the enclosure.

Fencing posts to be of hardwood 7 feet 6 inches long (2 feet in the ground and 5 feet 6 inches above the ground), not more than 12 feet apart, and to measure 6 inches by 2 inches if of sawn timber, 6 inches by 3 inches at the small end in the case of split posts, and 5 inches in diameter at the small end if round posts are used. Strainer and corner posts to be 8 feet 6 inches long (3 feet in the ground and 5 feet 6 inches above the ground) and to measure 7 inches in diameter at the small end.

At the entrance to the enclosure an enclosed yard 6 feet long by 4 feet wide to be constructed either within or without the enclosure, the fencing for this purpose to consist of 60-inch rabbit-proof netting, No. 17 gauge, 1¼-inch mesh, 6 inches in the ground and 4 feet 6 inches above the ground, affixed to three No. 10 plain galvanised wires; one plain wire to be fixed 9 inches above the top of the wire-netting.

The posts to be erected within the main enclosure for supporting this fence to be of hardwood 7 feet 6 inches long (2 feet in the ground and 5 feet 6 inches above the ground), not more than 12 feet apart, and to measure 6 inches by 2 inches if of

sawn timber, 6 inches by 3 inches at the small end in the case of split posts, and 5 inches in diameter at the small end if round posts are used.

In addition to the entrance gate into the enclosure another gate shall be constructed in the yard. Each gate shall be covered with rabbit-proof netting and to be fitted with strong springs to ensure that they shall be kept closed, or be so constructed as will prevent more than one gate being open at the same time. The inner gate to open inwards into the closure and the outer gate to open outwards.

Specification "B."

The inner enclosure shall consist of 42-inch rabbit-proof wire-netting (6 inches in the ground and 3 feet above ground), such netting to be No. 17 gauge, 1¼-inch mesh, and to be affixed to two No. 10 plain galvanised wires (one 18 inches above the ground and the other 3 feet about the ground), one plain wire to be fixed 9 inches above the top of the wire-netting.

The fencing posts for the inner enclosure shall be of hardwood 5 feet 9 inches long (2 feet in the ground and 3 feet 9 inches above the ground), not more than 12 feet apart, and to measure 6 inches by 2 inches if of sawn timber, 6 inches by 3 inches at the small end in the case of split posts, and 5 inches in diameter at the small end if round posts are used.

A gate opening inwards may be provided.

2.—REGULATIONS.

REGULATIONS UNDER "THE ANIMALS AND BIRDS ACTS, 1921 TO 1924."

Department of Agriculture and Stock,
Brisbane, 23rd January, 1930.

THE Deputy Governor, acting for and on behalf of His Excellency the Governor, and by and with the advice of the Executive Council, has, in pursuance of "*The Animals and Birds Acts,* 1921 *to* 1924," been pleased to amend Regulation 50 of the above-mentioned Acts, and to make the following additional Regulations.

W. H. BARNES.

PART I.

Amendment of Regulation.

Regulation 50 is hereby amended by the addition, after the word "Rabbit" in the Schedule thereto, of the words "other than the Angora Rabbit, Chinchilla Rabbit, or other approved hutch fur-bearing rabbit."

PART III.

Licenses to keep fur-bearing rabbits.

51. Every person who desires to keep Angora rabbits, Chinchilla rabbits, or any approved fur-bearing rabbits shall make application to the Under Secretary for a license, accompanied by the prescribed fee payable in that behalf. The Under Secretary may, at his discretion, grant a license to the applicant in accordance with Form P hereto. Licenses shall not be transferable, and shall be applicable only to the area specifically mentioned therein, and may be withdrawn and cancelled at any time without notice. The number of rabbits specified in the license shall not be exceeded.

Maintenance in enclosures.

52. Such rabbits shall at all times be maintained by such licensee within a rabbit-proof enclosure, constructed to the satisfaction of the Minister or any officer authorised by him, and no rabbit shall be removed by the licensee or any other person or persons from a licensee's holding, or by him or them permitted to escape therefrom, except under a permit issued by the Under Secretary. The Minister or any other officer authorised by him shall have the right of inspection at any time.

53. In the event of failure to renew or withdrawal or cancellation of the license, all rabbits in respect of which the license is issued shall be destroyed by the licensee, or in default of him by any person authorised by the Minister, who shall have power for that purpose to enter upon premises to which such license applies, or the premises where such rabbits may be held for the time being.

Inspection and license fees.

54. The following fees shall be payable:—

	Per Annum. £ s. d.
For license to keep up to 25 rabbits	0 10 0
For license to keep from 26 to 50 rabbits	0 15 0
For license to keep from 51 to 100 rabbits	1 0 0
For license to keep from 101 to 200 rabbits	1 10 0
For license to keep from 201 to 400 rabbits	2 0 0
For license to keep each additional 100 or portion thereof ..	0 10 0

The above fees cover inspection and license fees, but where the requisite structures have not been erected in accordance with the conditions mentioned, and a further inspection is subsequently necessary, the applicant will be required to pay the extra expense involved before a license will be issued. Licenses will expire on 31st December in each year.

Limitation of licenses.

55. Licenses will only be issued for rabbits to be kept in the following pastoral districts:—

Darling Downs, Moreton, Wide Bay, Burnett, Port Curtis, South Kennedy east of 148th meridian, North Kennedy, that portion of Cook comprising the Petty Sessions districts of Atherton, Cairns, Innisfail, and Herberton.

Penalty.

56. Any person committing a breach of these Regulations shall be liable to a penalty of fifty pounds.

[Form P.]

"THE ANIMALS AND BIRDS ACTS, 1921 TO 1924."

LICENSE.

TO KEEP APPROVED FUR-BEARING RABBITS.

Subject to the conditions hereinafter specified, , of , is hereby licensed under the abovementioned Acts to keep rabbits at for the period beginning the day of , 19 , and ending the thirty-first day of December, 19 .

Conditions.

1. That the number of rabbits kept shall not exceed the number for which this license is granted.

2. That the rabbits shall be kept in an enclosure constructed in accordance with specification prescribed by the Under Secretary.

3. That the enclosure shall be kept padlocked during the night and during the absence of supervision.

4. That the rabbits shall be kept in hutches within the enclosure or in an inner enclosure constructed in accordance with specification prescribed by the Under Secretary.

5. The hutches shall be provided with doors, which shall be kept padlocked.

6. That the rabbits and the enclosures and hutches in which they are kept may at all times be inspected by any officer authorised for that purpose by the Minister of Agriculture.

7. That the carcasses of all rabbits that die from disease, and all excreta, shall be destroyed by fire.

8. That the rabbits shall not be kept at any place other than the address above stated.

9. That the rabbits shall not be removed or permitted to escape from the above-stated address unless a permit for the removal has been issued by the Under Secretary, Department of Agriculture and Stock, Brisbane.

10. That this license is not transferable, and may be cancelled by the Minister of Agriculture at any time without prior notice to the holder thereof.

Given under my hand, at Brisbane, Queensland, this day of , 19 .

Under Secretary for Agriculture and Stock.

CLIMATOLOGICAL TABLE—AUGUST, 1930.

SUPPLIED BY THE COMMONWEALTH OF AUSTRALIA METEOROLOGICAL BUREAU, BRISBANE.

Districts and Stations.	Atmospheric Pressure. Mean at 9 a.m.	Shade Temperature. Means. Max.	Means. Min.	Extremes. Max.	Date.	Min.	Date.	Rainfall. Total.	Wet Days.
Coastal.	In.	Deg.	Deg.	Deg.		Deg.		Points.	
Cooktown	30·06	80	64	85	26	54	2, 3	14	1
Herberton	..	73	48	79	8, 9, 26	34	15	5	1
Rockhampton	30·12	77	53	84	21	40	13	141	5
Brisbane	30·11	72	51	82	30	42	14	176	8
Darling Downs.									
Dalby	30·14	69	42	78	29	29	16	250	5
Stanthorpe	..	61	36	72	29	22	13,16	249	12
Toowoomba	..	63	42	76	29	27	16	173	6
Mid-interior.									
Georgetown	30·04	85	51	93	20	39	14	66	2
Longreach	30·10	79	47	92	29	36	4	0	0
Mitchell	30·13	70	39	87	29	26	13	132	4
Western.									
Burketown	30·05	84	58	91	19	48	5	9	1
Boulia	30·09	79	47	93	29,30	39	5	0	0
Thargomindah	30·10	70	46	85	29	37	4,12	34	1

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF AUGUST, IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALL DURING AUGUST, 1930 AND 1929, FOR COMPARISON.

Divisions and Stations.	Average Rainfall. Aug.	No. of Years' Records.	Total Rainfall. Aug. 1930.	Aug. 1929.
North Coast.	In.		In.	In.
Atherton	0·82	29	0·05	0·26
Cairns	1·72	48	0·97	0·84
Cardwell	1·28	58	0·20	0·24
Cooktown	1·28	54	0·14	0·43
Herberton	0·63	43	0·05	0·06
Ingham	1·48	38	0·18	0·47
Innisfail	5·03	49	1·93	1·85
Mossman	1·23	17	0·89	0·33
Townsville	0·52	59	0·05	0
Central Coast.				
Ayr	0·59	43	0·11	0
Bowen	0·67	59	0	0·27
Charters Towers ..	0·57	48	0	0
Mackay	1·06	59	0·89	0·19
Proserpine	1·36	27	0·30	0·74
St. Lawrence.. ..	0·86	59	0·13	0
South Coast.				
Biggenden	1·08	31	1·87	1·42
Bundaberg	1·28	47	2·64	0·39
Brisbane	2·05	79	1·76	0·95
Caboolture	1·55	43	2·59	1·00
Childers	1·22	35	2·28	0·82
Crohamhurst ..	2·19	37	2·96	1·25
Esk	1·54	43	1·65	1·43
Gayndah	1·17	59	1·79	0·69
Gympie	1·75	60	1·93	1·21
Kilkivan	1·46	51	3·00	1·80
Maryborough ..	1·66	58	3·43	0·70

Divisions and Stations.	Average Rainfall. Aug.	No. of Years' Records.	Total Rainfall. Aug. 1930.	Aug. 1929.
South Coast—continued:	In.		In.	In.
Nambour	1·86	34	2·15	1·07
Nanango	1·36	48	1.19	1·32
Rockhampton ..	0·96	43	1·41	0·05
Woodford	1·73	43	1·77	1·06
Darling Downs.				
Dalby	1·21	60	2·50	0·29
Emu Vale	1·17	34	1·36	0·77
Jimbour	1·20	42	1·38	0·64
Miles	1·15	45	1·54	0·44
Stanthorpe	1·81	57	2.49	1·13
Toowoomba ..	1·69	58	1·73	0·69
Warwick	1·51	65	1·13	0·68
Maranoa.				
Roma	0·96	56	0·81	0·21
State Farms, &c.				
Bungeworgorai ..	0·86	16	0.53	0·19
Gatton College ..	1·18	31	0.92	1 02
Gindie	0·69	31	0	0·15
Hermitage	1·29	24	1·63	0 55
Kairi	0·89	16	0	..
Mackay Sugar Experiment Station ..	0·94	33	0·60	0 24
Warren	0·85	15	..	0

GEORGE. G BOND, Divisonal Meteorologist.

PLATE 130.—MR. J. A RUDD'S "HAFROD SENSATION," CHAMPION HARNESS PONY, BRISBANE SHOW, 1930.

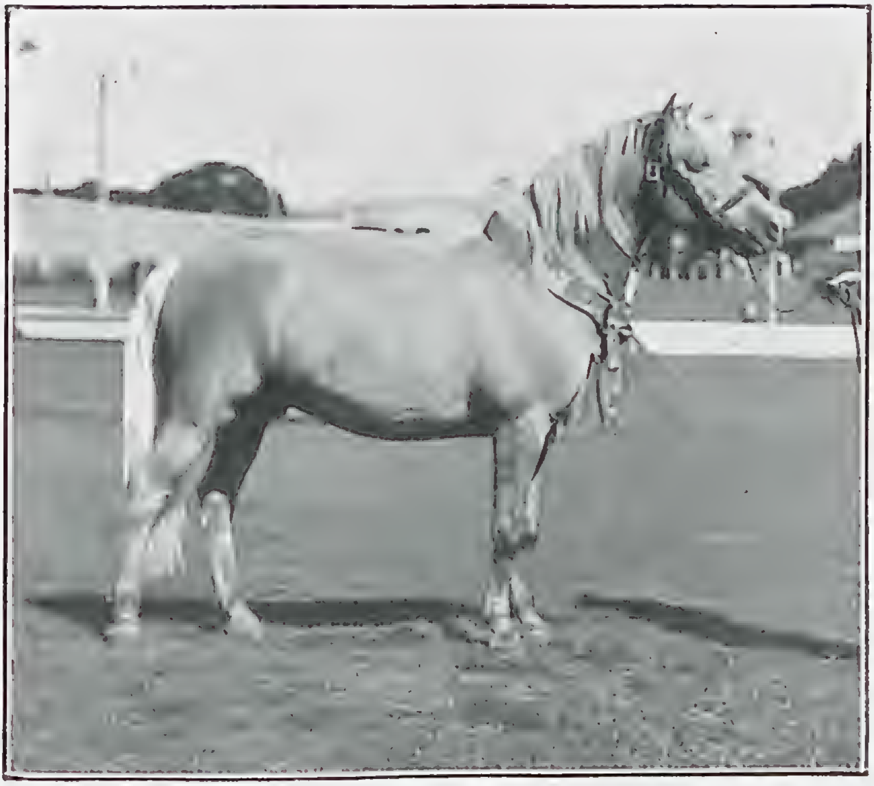


PLATE 131.—"BYRONS PRIDE," CHAMPION SADDLE PONY STALLION, BRISBANE SHOW, 1930—THE PROPERTY OF MR. W. T. MULRONEY.

FARMERS' SHEEP AND WOOL.

By J. CAREW, Senior Instructor in Sheep and Wool.

PART I.

This is the first article of a series planned for the purpose of supplying some of the information sought from time to time by readers interested in sheep and wool; and also with the hope of stimulating interest in sheep raising on comparatively small holdings

SHEEP COUNTRY IN QUEENSLAND.

WITH an area of over 430,000,000 acres, it is impossible to lay down any hard-and-fast rule in connection with sheep farming in Queensland, but still there are certain areas where both soil and climate are deciding factors in favour of this branch of animal husbandry.

The merino is the dominant breed in Queensland, and it may be regarded as the most suitable throughout the central and western portions of the State; whether they are serving the best purpose over the remainder of our territory has still to be decided.

The area embracing the country from the South Australian border, along the New South Wales border to Goondiwindi, thence westward to Camooweal may be described as being suitable to the merino. Some local influences hamper sheep farming in parts of this area, chiefly lack of sufficient improvements and the dingo pest.

In this division there are distinct areas suitable for cultivation, but on account of its more or less restricted rainfall it is mostly grazing country. Cultivation would mean the destruction of native pastures to the extent to which it is practised. With no certainty of sufficient rain during a crop-growing period, the wisdom of cultivation for fodder would be open to question.

The Treeless Plains.

In this western area there are wide variations of both soil and vegetation. Large stretches of country carry grass, but no trees or shrubs. Mitchell and Flinders are the two chief indigenous grasses on these areas; both make good sheep feed, and during the greater period of their growth are suitable for fattening and for wool-growing. In normal to good years the carrying capacity of this country is high, but in the summer the want of shade is seriously felt. This is intensified in dry years when the sun and wind have full play on the open plains.

Comparatively small areas in this class of country cannot be regarded as suitable for breeding purposes, but the type of wether most suitable for producing wool can be conveniently secured by the new settler. The systematic planting of shade trees would alter existing conditions considerably; and the erection of shelter sheds, especially near the watering-places, could well be brought within the scope of good management.

The Rolling Downs.

The downs country, interspersed with trees and shrubs, is ideal sheep country, with usually a good covering of Mitchell and other grasses; and in many places edible herbage, including some varieties of salt bush. Many of the shrubs and trees are also edible, making a good standby in times of drought. It is in this class of country that sheep breeding can be carried on most successfully. The strong-wooled type of merino has been found to be most suitable for the conditions, and from these areas large numbers of breeding ewes are distributed to areas less suitable for breeding purposes, while wethers, chiefly, form the wool-producing flocks on the treeless plains. The great work of the old pioneers in these western areas in establishing flocks successfully under difficult conditions redounds to their credit; but the chief factor in later success was the raising of the standard of the breed to a type best fitted to withstand hard conditions and still give a greater weight of wool.

Western Queensland merinos are singularly healthy, so that, notwithstanding the ravages of the dingo, blowfly, and drought, we still look to the western country to keep the breed intact. The runs in this area are to a great extent fairly large, but changes are looming high, and many of the large leaseholds, as their term expires, are reverting to the Crown, when they are likely to be made available in smaller

holdings. Whether the change will be to the detriment of the industry or not remains to be determined. Where small runs are established their owners are usually more closely associated with their own property management.

Heavily Timbered Downs Country.

This class of country is usually regarded as light carrying country, but safe, owing to the presence, besides grass, of many edible trees and shrubs.

To get the best results out of this class of country, systematic ringbarking should be carried out in order to kill out all useless trees, thus giving grass and edible herbage a better chance to develop, while still retaining sufficient trees to provide necessary shade and a reserve of fodder for dry times besides affording a windbreak for the protection of the pasture.

Scrubby Country

This class of country carries little or no grass and can be greatly improved by ringbarking the major portion, but allowing shelter belts to remain.

The amount of dry timber after ringbarking would be excessive, and difficult for sheep to go through, therefore it may be beneficial to run a fire over the first growth of grass when dry.

To clean the surface of all timber, however, may be inadvisable, and not of benefit to the pasture, for otherwise the land surface would be subject to the direct rays of the sun and to the drying or scorching effect of hot winds.

The Plateau Divisions.

These may be described as the south and central plateaux and lie between the contour of the coastal areas and the western divisions, taking in the Darling Downs, part of the Burnett and Clermont, and the Springsure districts, where we meet a variety of changes in soil, climate, and rainfall.

On the Darling Downs many owners run small flocks in conjunction with mixed farming. Both the merino and Corriedale breeds are successful as well as the progeny of the British long wool and merino crosses.

The Burnett has few sheep, but with closer settlement on suitable areas mixed farming practice should warrant the introduction of many small flocks. The central plateaux, including the Springsure and Peak Downs areas, run large flocks of sheep, chiefly merino.

Much further improvement and general development is necessary in this class of country. In large areas the advantage of judicious ringbarking of useless timbers has yet to be experienced. Cattle and sheep, to be run successfully, must have their respective paddocks, though they may be allowed to run together at times, especially in good seasons. The sheep should have a secure paddock in which they can be kept when necessary.

If a dairy herd is greater than can be conveniently worked the farmer's income can be greatly augmented, at little labour outlay, by running a flock of sheep sufficiently large to stock up the spare pasture. In a dry season when little or no return is obtained from the dairy herd the sheep will usually maintain their share of the earnings; therefore, the economic value of sheep as income-producers should be recognised when considering mixed farming. Working from north to south, we find large areas suitable for mixed farming, including much of the Clermont, Peak Downs, Springsure, Burnett, Darling Downs, and Maranoa districts. Many places are to some extent isolated from the railway, and where holdings of a fair area are made available grazing only can be followed with success. Still, cultivated crops should be grown in order that the quantity of fodder to tide over times of scarcity shall be held in reserve, thus getting over the difficulty and expense of freight and cartage.

In this plateau division there are large areas thickly timbered. Where green timber is in abundance sheep will not thrive owing to the grass being usually sour. The varieties of trees it carries indicate to some extent the nature of the country. Brigalow and belah scrub lands are practically useless for sheep until the timber is killed, after which it gradually improves, becoming first class for sheep breeding and wool growing. Ringbarking is recommended as against falling and burning, chiefly to avoid suckering.

Box and sandalwood country in this area is suitable for wool growing. It is light carrying country, but by judicious ringbarking it can be improved wonderfully. Patches of shelter belts should be left in suitable places and odd trees left in regular stands as breakwinds. Speargrass occurs heavily, as a rule, in bloodwood and ridgy country. Although in other respects of good fodder value, it is to be avoided for

sheep growing, particularly from the time it matures until it sheds its seeds. By bringing this class of country under cultivation, if possible, for a season or two the speargrass may be eradicated, and useful crops secured. On reverting to grass this land usually becomes first class for sheep.

Much of the country in the plateau area, now devoted to carrying wethers for wool production, could be put to much more profitable use by running a ewe flock properly cared for. A ewe flock could not be expected to produce as much wool as wethers, but with the addition of the quantity of wool produced from, say, a 60 per cent. lambing, the difference would be but slight. However, it is in the natural increase where the advantage is secured, and in country where the rainfall is from 20 to 30 inches, and where part of the run is suitable for cultivation, the aim should be to produce crops either for grazing the ewes and young lambs or for conserving it for fodder against times of scarcity. In this connection, there is a big opening for further development, and should the fodder secured in good seasons be held as a reserve against lean periods the sheep industry would not be subjected to such heavy losses as have recurred from time to time. To carry the number of sheep now depastured on most of the holdings in Queensland at the present time is, under existing conditions, certainly running a risk. Experience has taught us that, even when comparatively small numbers of sheep had large areas to roam over, heavy losses occurred for want of sufficient nourishment.

That country varies considerably will be quite understood, and large areas will be found altogether unsuited for breeding purposes owing to want of quality in the pasture even during normal years. Where wethers are run for wool production only, this want of special quality in the pasture is not so seriously regarded, for if they do lose condition during the off season after frosts it is only what can be expected, and unless sudden changes occur the growth of wool will not be seriously affected.

By a regular, but not an over-abundant, supply of food wool will improve in both quality and condition. In country too poor for breeding purposes, or where an excessive growth of green timber is found, wethers are the most suitable to run; but on holdings favourably situated a breeding flock should be established and maintained. To do this in some districts is not difficult, but usually precautions regarding over-stocking are taken into consideration. However, all calculations will at times be upset, unless some provision is made to guard against a tendency to over-stock.

Unfortunately, many of our richer districts with a rainfall averaging 25 to 30 inches per annum are regarded as unsuited for breeding purposes. It is to these areas that the work of combined effort on the part of the stockowner, the agriculturist, and the scientist should be directed in order to secure the successful breeding of sheep of suitable breeds.

The Coastal Area.

This area embraces all the country between the Dividing Range and the sea, of which a considerable extent is useless for sheep, being either badly drained naturally or carrying coarse and unpalatable grasses. The areas with a good annual rainfall of from 35 to 60 inches, suitable and carrying good pastures, are, as a rule, used for dairying. Other areas embrace rich alluvial soils suitable for the production of a variety of crops. The holdings in this region are usually small as compared with those on the plateaux and in the Western Division, and dairying in combination with agriculture is the chief industry. I look upon the dairy cow as the most useful and profitable animal that can be run on the farm where climate and rainfall are suitable. With cows, pigs and fowls may be associated. Sheep farming should, however, be an added profitable line in mixed farming, and, if worked on right lines, should be the means of greatly increasing the wealth of this coastal country without in any way detracting from the value of any other payable enterprise.

Apart from wool production, the output of lamb and mutton would be increased. Through a system of a quick turnover in live stock, it would pay better to market many crops as mutton than to sell them as fodder. My contention is that some form of industry should be established that would act as a balance between over-production at low prices and stagnation. That this is possible with sheep in the coastal areas of Queensland I feel certain. Thousands of acres in this area could be put to much better use than is the case at the present time, and sheep farming under suitable conditions and with proper management is worthy of serious consideration.

The Northern Tablelands.

In conisdering this area the matter of local environment must be taken into account. We must concede the fact that sheep are very adaptable animals, but that adaptability may not be possessed by all breeds to fit all conditions.

Where the conditions are wettest the Romney Marsh should be selected. This breed will feed and hold condition when other breeds will shelter and suffer. As the demand for mutton is not supplied to the same extent in this part of the State as compared with others, higher local prices rule, and this should made the undertaking more profitable. Wool production in this area should be of secondary consideration. Where breeding can be carried on successfully the ewes should be sold as fats after rearing three or four lambs.

The breed possessing the strongest constitution and suitable to wet conditions and resistance to parasitical infestation should be chosen.

[TO BE CONTINUED.]

A GROWING QUEENSLAND ENTERPRISE.

The showrooms of the Queensland Pastoral Supplies, Ltd., in their new warehouse Bowen street, Brisbane, are fitted up on modern lines, a complete range of everything stocked being shown and clearly marked in plain selling figures for the convenience and information of patrons. The main showroom measures 100 ft. by 80 ft., and the actual warehouse floor space of this firm, since acquiring Perry Bros.' workshops, now exceeds 2 acres. The vast array of goods includes all groceries, fencing material, windmills, troughing, engines, gates, wireless, stoves and ranges, tools, kitchenware, furniture, and agricultural machinery. In addition, a display

PLATE 132.—BRISBANE SHOWROOMS, QUEENSLAND PASTORAL SUPPLIES.

of their valuable agency lines includes Hibiscus wire, Venus motor spirit and kerosene, Coleman lamps and lanterns, Hibiscus stock lick and auto-screw droppers, Beeman tractors, &c. A novel feature is a revolving summer-house, actually built up with all the various building material this firm supplies, including fibro-cement sheets, Wunderlich ceilings, cement tiles, rubber roofing and flooring, ten-test, and three-ply wood; inside are enamelled bath, cement tubs, wire gauze screens, stove recesses, and window shades. This enables those intending to build to see exactly the method that appeals to them—together with a comparison in cost.

Reading and rest rooms and a flat recreation roof are placed at the disposal of clients, together with free garaging of their cars.

This firm secured first prize at the recent Brisbane Exhibition for Hibiscus fencing wire, New Era separators, Astor wireless, and Hibiscus stock lick. Our readers can secure their large illustrated catalogue free of charge.

IODINE TO PREVENT DISEASE.

The part played by correct mineral feeding in keeping at bay such scourges of the dairy industry as mastitis, contagious abortion, and Johne's disease was emphasised by Lt.-Col. H. A. Reid, F.R.C.V.S., in an address on these diseases, which he characterised as "three foes of the dairy industry," before the South-Eastern Jersey Club, in London, under the chairmanship of Sir William Wayland. Col. Reid reviewed the very latest advances of modern science in dealing with these diseases, and pointed out that as no effective cure was yet known it behoved every farmer to increase the resistance of his cattle by ensuring an adequate mineral diet to them. The high light of interest in the speaker's address lay in his advocacy of a dosage of iodine. Iodine has been proved to be an agent of great value in conserving the mineral constituents of the body, and Col. Reid went so far as to say that the feeding of a small quantity of iodine daily by stock farmers would greatly lower the incidence of infection by the costly diseases mentioned above.*

Col Reid's address was as follows:—

I AM not going to refer to tuberculosis, because it would take me the whole afternoon to deal adequately with the subject. My address will therefore cover three diseases of almost equal importance—Johne's disease, an affection which is of almost equal importance with tuberculosis and is increasing in this country; mastitis, a disease of the very greatest economic importance; and lastly, contagious abortion. Abortion is one of the greatest curses of all countries where cattle breeding and dairying are carried on. The various conditions attendant on the infection render abortion one of the worst afflictions cattle owners have to contend with.

Mastitis.

Of these three diseases I propose to deal with mastitis first. Mastitis is often called mamitis or inflammation of the udder, and by herdsmen garget or weed. This affection constitutes one of the most troublesome and costly enemies the cattle breeder has, and, from the point of view of treatment, one of the most unsatisfactory diseases with which we have to deal. Its sudden onset and its liability to affect cows at their most profitable period makes the disease very formidable. The cause of this trouble is an infection due to the entrance of a variety of micro-organisms—the streptococcus called *mastidis.* This is the common causative agent, though many others may be implicated. It gains entrance to the udder by way of the teat canal, and also through sores and abrasions on the skin of the udder and the teat, which is a frequent source of mastitis in cattle.

Predisposing Causes.

The predisposing causes I consider are: First, an abnormal development of the udder due to selective breeding for milk production, which has resulted in the production of large udders. There is obviously a wider field for infection to take place, and also there is a greater liability to injury. There, again, in these high-yielding cows you have an abnormal pressure of milk, causing dilation of the teat sphincter. The presence of flies which occurs in summer helps to convey the organism from cow to cow. Again, insanitary conditions help towards infection. Colds and draught also render the cow susceptible to infection. The trouble used to be always attributed to chill in the old days, but that was only a predisposing cause, the effect of chill being, of course, to lower resistance. Herdsmen still attribute enormous importance to chill, draughts, and fresh air. You must, of course, be careful to have fresh air, and the herdsmen do not like it.

Mastitis must always be regarded as contagious, and the appearance of one case is liable to be followed by further outbreaks, especially where sanitary measures are neglected. A case of mastitis should immediately be isolated. Then the practice resorted to by commercial milk producers in allowing the first few drops of milk to fall on the floor; failure to wash before milking; failure to observe general cleanliness in the byre and disinfect milking machines properly—all these might contribute to bringing about the disease.

Danger to Public Negligible.

As to the danger to public health from this disease, I think this has been greatly exaggerated. To begin with, milk from an inflamed quarter must not and would not be mixed with other milk. I do not think, therefore, that this is often the case, except occasionally by accident. In the course of my experience I have cultivated

* From a report in the "Livestock Journal" (England).

pure cultures of streptococci in milk I have consumed, and have persuaded my assistants to do likewise, and nothing has happened to us at all. That does not, of course, necessarily go very far. We were adults, and it does not necessarily mean that infants or delicate people might not be affected. At the same time, I do not think it is fair to try to sheet home to the cow all outbreaks of disease among humans. Infection depends on the length of the lactation. If the dry period of the cow be a short one, the organism may persist in the udder and recur after the next calving. Mastitis is more common among easy milkers, i.e., those cows with an easy sphincter. The use of a teat siphon for hard milkers is another frequent source of infection.

As regards prevention of infection, first of all cleanliness comes first, and then the intelligent use of disinfectants. Don't use them too strong, nor yet too weak. Every cowshed should be disinfected twice a year or more often. Milk should never be strippd on to the ground, but into a receptacle containing a little disinfectant. The cleanliness of the floor should be attended to, and an effort should be made to get rid of flies. Before milking, the hindquarters and the udder should be washed with a damp cloth dipped in some weak solution of disinfectant. After milking, the udder should be wiped dry. Cleanliness of the milkers is very important. Milkers should not be allowed to attend to septic cases, and then carry on their duties afterwards. The udders of overstocked cows should be eased.

With regard to treatment, very little progress has been made, and treatment remains palliative. The older the case the greater the difficulty of securing recovery. Vaccine treatment is being pushed somewhat at the present time, but I have come to the conclusion that it is of very little use at all. It will not prevent animals contracting mastitis, and it will not cure them. Moreover, in many cases, vaccine treatment may be attended with great danger. The use of antiseptic injections is also a method which has been in vogue for some time, but as a matter of fact you cannot disinfect the udder in this way when the cow is standing. We are thus reduced to palliative measures, such as fomentation, &c., and attention to the general health.

Contagious Abortion.

Abortion is a term which includes the conditions known as metritis, sterility, and difficulty of getting the cow in calf. The cause is infection of the womb by a specific bacillus—an organism which is easily destroyed by disinfection.

The method of infection is generally by swallowing contaminated food or water, or by licking the parts of other cows soiled by infected passages. The role played by the bull in conveying infection is now considered of secondary importance. Although there is some danger, perhaps, it is a remote one. It is important to realise that the udder acts as a reservoir of infection in these cases, and on pregnancy the infection proceeds to the womb. Abortion usually takes place between the fifth and sixth month, but this is liable to wide variations.

Acquired Tolerance.

It is important to realise that tolerance to infection may be acquired, and possibly an immunity established. Calves reared in infected herds possess a degree of tolerance to the disease, but they may constitute carriers.

Methods of diagnosis employed are—(1) the agglutination test, and (2) the *abortin* test. The latter is a preparation similar to tuberculin. In aiming at control of the disease the herd must be divided into two—the infected and free animals—and separation must be complete. The clean herd must be tested periodically and all reactors transferred. All discharges must be burned, and douching must be gone on with until after all discharges have ceased.

As regards curative treatment, there is none worthy of notice. Is it possible to vaccinate cattle against the disease? Well, with the use of dead vaccines the results are considered to be more or less worthless, but the results from live vaccines are more promising. There are, however, a good many dangers attendant on the use of live vaccine. You run the risk of converting the hitherto clean cow into a carrier.

Undulant Fever.

Another danger is the relationship between bacillus of abortion and undulant fever of humans. The medical people say that if the organism you introduce into the cow is a living one it will be shed in the milk and find its way into the public milk supply, and may give rise to the symptoms of undulant fever. Quite a number of cases in this country and America have been alleged to be due to infection from this source. For my part, however, I think the chances of danger are remote.

Johne's Disease.

Johne's disease affects both bovines and sheep. It is a serious and steadily increasing disease, comparable in its ravages with tuberculosis. The disease may be present in cattle for months before symptoms become evident, and during that time such cattle act as potential centres of infection for others. The symptoms are unthriftiness, wasting, and diarrhœa.

No recognised cure exists. Early diagnosis and the slaughter of infected stock is at present the most economical method of control. In certain cases it may be worth while to attempt treatment to check the diarrhœa, as, say, in the case of valuable cows, until after the birth of the progeny. An injection of formalin and dilute sulphuric acid has led to good results.

As regards diagnosis, the preparation *Johnin* inoculated intra-dermally has proved of value in revealing the presence of the disease. The employment of tuberculin made from avian tubercle bacilli was also used. Another method of diagnosis was the microsopic examination of scrapings of the bowel wall. Various forms of vaccines have been tried in an endeavour to find a preventive, but none so far can claim great success. Early diagnosis and elimination of the infected cattle is the most prudent course. As to infected pastures, one observer (Dunkin) recommends chain harrowing in two directions until all cow pads have been broken up. After this the fields should be dressed with one ton of fresh quick lime per acre, or on clay soils one and a-half tons to the acre.

Minerals Essential.

It will be gathered from what I have said that no specific treatment for any one of these diseases exists. The modern tendency, however, is to aim at prevention, and in this connection it is immensely important to realise that in cattle feeding an adequate mineral supply must be provided in the ration. The feeding of the concentrated foods used for high yielders tends to cause a still further loss of lime salts to the tissues. Recent work on animal nutrition suggests that many health troubles are due to the comparative lack of minerals in the artificials.

It has been shown by various workers that iodine acts as a conserving force to the mineral elements of the tissues. I should like to read a formula of a typical mineral diet which is advocated by Major Wall, a stock breeder in Natal:—

Bone meal, 40 lb.; finely ground limestone, 40 lb.; common salt, 20 lb.; flowers of sulphur, 5 lb.; oxide of iron, 1½ lb.; and iodine of potash, 3 oz.

This is suitable for all classes of stock. The value of iodine lies in the fact that the thyroid gland, which plays a prominent part in defending the body from disease, must be fed with this substance. Heavy manuring of pastures has been shown to exhaust the iodine content.

I would suggest that, in relation to the diseases I have mentioned, if this system were adopted of giving susceptible animals iodine in very small doses, then we should see a distinct decline in the incidence of these infections.

The Discussion.

Mr. E. Corrie, who opened the discussion, said that Col. Reid had mentioned three particular diseases which affected dairy cows, and which were incurable, but he thought there was probably a much longer list. It was time that the farmer appreciated that he himself was the primary cause of a great deal of the trouble which was occurring among live stock in this country. He was absolutely certain that a great deal could be done to prevent disease among live stock and humans if care was taken that they absorbed sufficient of all the elements essential to reproduction and so forth. Mineral feeding had come to stay, and was going to be accepted as a necessary part of the feeding of live stock. These facts were significant:—

Mastitis and other diseases attacked the cow just at the time of greatest drainage on the system.

The iodine content of colostrom or first milk was greater than of any other milk.

Iodine deficiency was, he thought, at the root of a great many of the troubles which occurred among young animals. He instanced a case of a farm in West Sussex where Johne's disease had taken a heavy toll for many years. He persuaded the owner to try feeding iodine, and he had a letter from him recently, saying that he felt satisfied that the disease had been cleared from the stock.

The Young Farmer.

CARE OF THE CREAM SEPARATOR.

At the Annual Conference of the Tweed and Brunswick Sub-district Councils of the Agricultural Bureau of New South Wales, held at Mullumbimby recently, Mr. J. C. McKenzie (Manager, Norco Ltd.) read an interesting paper on "The Manipulation and Care of the Cream Separator," which we reprint hereunder:—*

To start with I would explain that the old saying, "Familiarity breeds contempt," might well be applied to the separator, for quite a few of us have almost, one might say, been reared either on or close beside it; at least, it has been on every farm in this district for many years.

A separator is built to separate cream from milk, at a given correct speed, with a correct flow (or feed) of milk, and at a correct temperature (blood heat), yet we find if we put a watch on the revolutions that very often we are turning too fast or too slow and immediately try to remedy the wrong. It is only after quite a long period of trying that we are able to keep it near enough to the correct speed. We turn the milk on; and here I might say that quite a lot of our troubles are due to the fact that, while the maker of the separator, who should know something about the mechanism, has provided a vat and tap of certain dimensions to feed the machine, we imagine the vat too small and hard to keep filled, &c., and consequently get a bigger vat built by a tinsmith, who perhaps puts a tap and connection on the vat which in most cases varies the rate of intake intended by the maker. The consequence is that the machine is expected to do more than was intended—a 100-gallon machine is perhaps expected to separate 120 gallons per hour. If we look at the thing reasonably we have to admit that we are asking it to do more than it can, and we must not forget that if we put the milk into the machine it must come out of one or other of the outlets or overflow, so it is very necessary to see that the feed is regulated correctly.

Early Separation Advised.

Sometimes we find (in cooler weather especially) that by the time milking is finished and separating nearly, the cream has risen to the top of the milk yet to go through the machine. The natural tendency is for the operator to stir up the milk (with a metal, not a wooden stirrer, we hope) in order to break the cream and then put it through the separator. This again is asking the machine to do something it was not built to do—i.e., to take a large accumulation of cream out of a small amount of milk. It is therefore advisable to separate the milk while still as warm as possible after milking, and to prevent the cream from rising to the top of the milk in the vat by keeping it stirred during separating.

After the milk has been put through the machine, clean warm water should be used to flush the cream remaining in the machine. Water is preferable to milk for this purpose, as milk will sour, and thus affect the keeping quality of the cream, so it is not advisable to put milk into your cream if you wish it to be of the best quality. After separating, it is very essential that the machine be taken down immediately and the parts put into warm water. Wash the parts carefully with a good stiff brush, and rinse in plenty of warm water. Each part should be plunged into boiling (actually bubbling) water and allowed to remain for at least three minutes, then taken out and hung up in an airy place to drain. The dishes need special care after scalding, and they should be spaced sufficiently apart to prevent drops of water clinging to them.

When Cash is Lost.

Quite a number of farmers consider farm work more important than the running and cleaning of the separator, and consequently leave it to someone else, probably a hired youth or man, and forget, temporarily at any rate, that the separator is one of the principal factors determining their incomes. If it is not separating all the cream, they are losing cash, and if it is not kept thoroughly clean it will be the cause of second-grade cream, which means a loss of 2d. per lb. on their returns.

* From the New South Wales Agricultural Bureau Record, New South Wales Department of Agriculture, 18th July, 1930.

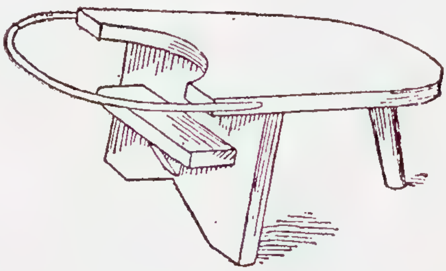
The Cream Screw.

Here is another matter which has a bearing on variations in cream tests. It is not an uncommon belief that, provided the cream (or regulating) screw of the separator remains unaltered and the rate of inflow and speed of the bowl are the same, the test of the cream will be the same, irrespective of the test of milk put through the separator. That is to say, if we had one lot of milk testing 4 per cent. butter-fat and a similar quantity of milk testing 3 per cent. butter-fat, and if these were put through the same separator under the same conditions as to temperature, rate of inflow, speed, &c., the test of the cream from each lot would be the same. This idea is not correct, as we will see if we follow it out. First of all, the function of the cream screw is definitely to proportion the milk or cream which flows through each outlet. When we alter the cream screw we alter the proportion coming from each spout, resulting in either more separated milk and less cream, or less separated milk and more cream. The test of the cream is altered indirectly in this manner, by increasing or reducing the amount of separated milk flowing through the cream spout. The alteration of the cream screw does not influence the amount of butter-fat which flows through the cream spout, but it results in a greater or smaller amount of separated milk passing through with the cream, which in turn gives the cream a higher or lower test. The average cream screw is set so that about one-tenth of the bulk will be delivered through the cream spout and nine-tenths through the separated-milk outlet. These proportions will vary slightly from time to time according to the set of the cream screw, but they will always remain the same in any one separator, provided there is no material difference in the temperature and rate of inflow of the milk, the speed of the bowl, &c.

While the butterfat test of the milk in the vat is the same, the test of cream will be the same under similar separating conditions, but as the test of the milk varies with weather conditions or seasons, the test of the cream will vary accordingly, unless the cream screw is adjusted to make up for the variation. To illustrate this point, let us take 100 gallons of milk testing 4 per cent. butter-fat and another 100 gallons of milk testing 3 per cent. butter-fat and put them through the same separator under exactly the same conditions. Let us assume that the cream screw has been set to deliver one-tenth through the cream spout and nine-tenths through the separated-milk spout. (For the purpose of this illustration the loss of fat in the separated milk can be neglected, as it would be the same in each case.) We would find that in each instance we had 10 gallons of cream. The lot from the 4 per cent. milk would test 40 per cent. in the cream, and the lot from the 3 per cent. milk would test 30 per cent. in the cream. We will thus see that though we put the two lots of milk through the same separator, under the same conditions, there is a difference of 10 points in the cream test. It will thus be seen that any variation in the test of the milk in the vat, from day to day, or month to month, will cause a corresponding variation in the cream test. If this point is properly understood, it will explain many variations in cream tests which at first sight may seem difficult to understand.

MILK STOOL.

The stool is made of three pieces of board and a piece of round iron. The appearance and manner of construction are clearly shown in the illustration. The seat board is sawn out to fit the circumference of the bucket to be used, and the



iron is also bent to this curve and fastened to the board as shown. The little shelf on the front support holds the bucket at the right height, and keeps it clean and out of the way of the cow's foot while milking.

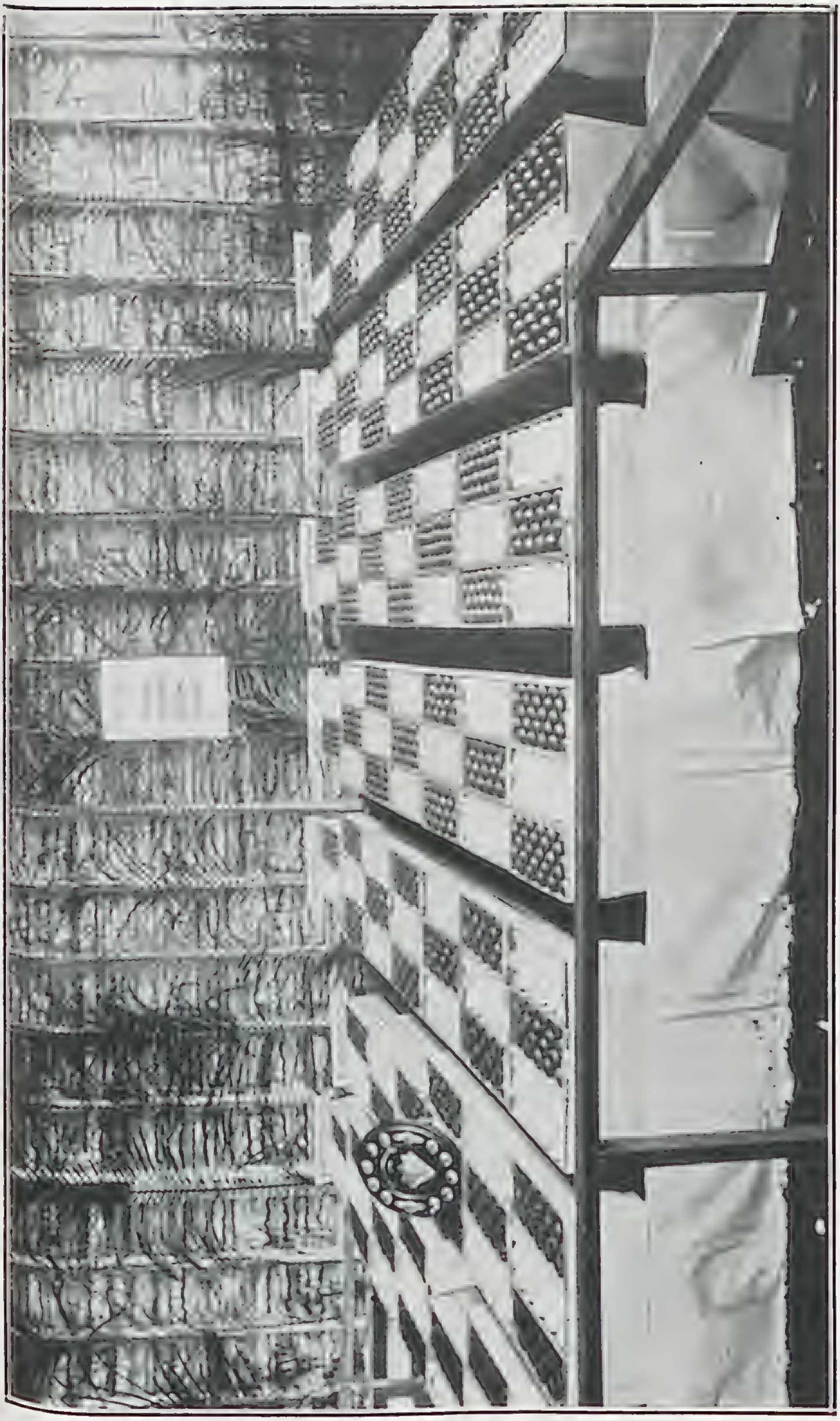


PLATE 133.—JOHN MACDONALD SHIELD COMPETITION FOR SCHOOL CHILDREN'S PACKING CLASSES, ROYAL NATIONAL ASSOCIATION SHOW, 1930.

This exhibit illustrated the value of the instruction arranged by the Education Department, in co-operation with the Department of Agriculture and Stock. The first award was won by the Flaxton State School.

Answers to Correspondents.

BOTANY.

The following answers have been selected from the outgoing mail of the Government Botanist, Mr. C. T. White, F.L.S.:—

Weeds Indentified.

"INQUIRER" (Mount Larcom)—The specimens have been determined as follows:—

(1) *Verbena bonariensis*, Purple Top, a common weed in Queensland, a native of South America but now widely spread in most warm countries.

(2) *Verbena macrostachya*, a native species of Vervain.

(3) *Malvastrum spicatum*, a weed of the Mallow family (Malvaceæ), very common in Queensland but for which I have not heard a common name.

All the foregoing are common weeds in Queensland and are not known to taint milk particularly more than the general weedy taste one gets in milk of cows fed largely on such fodder.

(4) *Carissa ovata*, a very common shrub and the only local name we have heard for it is Burr Vine, a rather ridiculous name as the plant is really a shrub, not a vine. In spite of its prickly nature, the plant has some reputation as a fodder in the district in which it grows. It extends some little way inland to the Brigalow and Bellah country. We do not think it would taint milk particularly.

Western Wonga Vine.

C.W. (Cooladdi, Western Line)—

The specimen is *Tecoma Oxleyi*, the Western Wonga Vine. It is not common in Queensland; in fact, the only other authentic specimen we have of it in our herbarium is from near Adavale; hence I was rather glad to obtain the specimen from you. It also grows in Western New South Wales and Central Australia. The broader leafed species *Tecoma australis* is fairly common on the coast and middle west.

Wild Passion Vine.

D.S. (Dululu, Dawson Valley Line)—

The specimen is the White Passion Vine or Wild Passion Vine (*Passiflora alba*), a native of South America, now naturalised and a very common weed on scrub farms in coastal Queensland. It is particularly abundant after a scrub burn. Feeding experiments carried out some years ago by the Department of Agriculture and Stock showed the plant to be poisonous. One feature brought out by the experiments was that the poisonous property of the vine is of a cumulative nature and that evidently a certain amount of the material must be eaten before symptoms of poisoning are made manifest. Regarding treatment the late Dr. Sydney Dodd, who carried out the feeding tests, made the following recommendations:—

"With regard to treatment of affected animals, first remove them to fresh quarters so that they are unable to obtain any more vines. If there is no difficulty in swallowing they should be given a drench of 1½ pints of linseed oil, by the mouth, in order to loosen the bowels. Epsom salts are not advisable, as in some cases there is inflammation of the bowels present. Working bullocks should be spelled until recovered. With animals in what may be termed the first stages of the disease, that is, those showing drowsiness and stupor, loss of appetite, and condition, &c., the best remedy is the injection of 18 drops or 1 c.c. of 1 per cent. solution of strychnine under the skin behind the shoulder, once a day for a few days (four or five) by means of a hypodermic syringe. For animals in the latter stages, that is, where convulsions are appearing, a sedative in the form of 6 drachms of bromide of potassium in a pint of water should be given as a drench, providing the animal is able to swallow, but it appears that in some cases this ability is lost. In such cases no drenches should be given at all, owing to the danger of the liquid 'going the wrong way' and so setting up inflammation of the lungs. The strychnine should be recommenced when the convulsions have disappeared."

Wild Millet. Louisiana Carpet Grass.

G.G. (Boonjie, Peeramon)—

The grass with seed head (a) is *Panicum crus-galli*, the Wild Millet. This grass is generally looked upon as one of the wild parents of such well-known cultivated fodders as Japanese Millet, White Panicum, &c. There are numerous forms of it scattered throughout the world of which several occur in Queensland, and the one you send seems to represent the common annual form which occurs in Queensland mostly as a weed in cultivation. It has, however, considerable forage value.

The other grass was not in seed but we should say it is *Axonopus compressus* or *Paspalum compressum*, the Louisiana Carpet Grass. This grass has come into prominence in the last few years in the Northern Rivers of New South Wales and Southern Queensland as a useful species for growing on the poorer classes of soils where the other grasses such as common Paspalum and Rhodes grass will not do.

"Chain Fruit" (*Alyxia ruscifolia*).

H.G. (Nanango)—

The specimen is *Alyxia ruscifolia*, sometimes known as Chain Fruit on account of the peculiar habit of the berries being apparently borne one on top of the other. It is a handsome shrub, either in flower or fruit. It can be propogated from seeds, or young plants may be readily transplanted from the scrub. The root wood has a pleasant smell, something like Orris Root. We do not quite know the plant you refer to with red berries growing in Tasmania, but we should not think it would be an ally of the present species.

Kikuyu Grass.

W.J.A., (Kin Kin, N.C. Line)—

The sample forwarded bears no seed heads, but there appears to be no doubt that it is Kikuyu Grass—*Pennisetum clandestinum*. There are certainly no specimens of *Axonopus compressus* (*Paspalum compressum*) mixed with it.

Kikuyu Grass is most readily distinguished by its flowers from all other grasses grown in Queensland. These are partially or almost entirely enclosed by the sheaths of the leaves at the tip of the shoots, and the anthers (male organs) are produced on conspicuous hair-like white stalks up to two inches long. Unfortunately, it does not flower freely, so that this means of distinguishing Kikuyu is not always available. The majority of grasses cultivated in Queensland, however, produce flowers in abundance. Carpet Grass, with which Kikuyu might be confused, has minute flowers arranged in two to four slender spikes at the apex of fine stems which are exserted from the sheaths of the leaves. Vegetatively, Kikuyu differs from Carpet Grass in several ways. The sheaths of the leaves are very loose and rounded, the leaves under cultivation are longer, narrower, and more pointed, whereas in Carpet Grass the sheaths are very strongly compressed, the leaves short, broad and blunt, and their margins fringed with minute hairs.

Stagger Weed or Wild Mint. *Phaseolus semierectus*.

W.A.A. (Esk)—

The smaller of the two weeds is *Stachys arvensis*, the Stagger Weed or Wild Mint, a very common winter and spring weed in cultivation paddocks in Southern Queensland and New South Wales. It causes staggers in working stock, but apparently is practically harmless to resting cattle. The question of the plant's being poisonous or not was rather a vexed one, but its power to produce staggers in working horses was definitely proved by feeding tests.

The larger growing plant is *Phaseolus semierectus*, a common tropical and sub-tropical leguminous plant, introduced into Queensland many years ago as a fodder. It is now moderately common as a naturalised weed in many places, but our experience with it in general is that stock do not take to it very much.

Chickweed.

G.P. (Rockhampton)—

The specimen is *Stellaria glauca*, a species of Chickweed. It is moderately common in some of the cooler parts of the State, such as the Darling Downs and the Granite Belt, but, so far as we know, has not previously been collected about Rockhampton. On that account we were rather glad to get the specimen.

Plants Identified.

H.F.M. (Waterford)—The specimens have been determined as follows:—

Aristida ramosa, a three-pronged spear-grass.

Panicum foliosum, Leafy Panic Grass.

1. *Salvia coccinea*, a native of South America, now naturalised as a common weed in many parts of coastal Queensland. Family *Labiatæ*.
2. *Diuris punctata*, a species of Ground Orchid. Family *Orchidæ*.
3. *Spermacoce brachystema*, a small plant of the family *Rubiaceæ*, very common in grassland in Queensland, but for which we have not heard a common name.
4. *Bowollia elata*, a native of South America, common in garden culture. It belongs to the family *Solanaceae*.
5. *Solanum nigrum*, a cosmopolitan weed, commonly known in Queensland as Deadly Nightshade, Blackberry, Black Currant, and other names.
6. *Solanum pseudocapsicum*, the Jerusalem Cherry. A plant moderately common in gardens and here and there met with as a stray. The native country is not certain, but is generally believed to be Madeira.

Burr Trefoil.

S.S. (Glen Aplin)—

The specimen is *Medicago denticulata*, the Burr Trefoil, a very common legume or trefoil in Queensland and New South Wales. It grows rapidly during the winter months but dies away on the approach of hot weather. It is generally regarded as a very useful fodder, and when the leaves die off, a number of little burr-like pods are left. These latter are quite greedily eaten by sheep. The plant would be valuable as a cover crop and for ploughing in for green manure, but seed, as a general rule, is not stocked by nurserymen. Once it obtains a footing on a property, however, it generally multiplies itself fairly well.

Cape Chestnut.

J.J.L. (Toowoomba)—

Your specimen is *Calodendron capense*, the Cape Chestnut, a native of South Africa belonging to the family Rutaceæ. It is a very handsome flowering tree, much cultivated about Brisbane on account of its showy character. We do not remember seeing the plant about Toowoomba, and the tree may be a bit tender with you.

PIG RAISING.

Tuberculosis in Pigs.

F.B.K. (Franklyn Vale, Grandchester)—

We are referring your letter on to the Chief Inspector of Stock for attention, and he will write you further re tuberculosis. However, it is quite apparent the young pigs to which you referred did not die as a result of tuberculosis. They probably died of constipation and as a result of the development of a form of pneumonia. This trouble developing rapidly would be responsible for the discoloured condition of the lungs. It is unlikely that tuberculosis would affect pigs two weeks old, nor is it to be assumed that because young pigs' tails drop off they are suffering from a contagious disease. This latter trouble may be due to sun scald or to some accidental cause, but though it seems a coincidence that the tailless pigs were condemned while those with tails were free of disease, this is not an indication of tuberculosis, but the fact that some of the pigs were condemned indicates that there is infection on the property, and this needs to be cleaned up.

To Rid Pigs of Lice.

H.C. (O'Bil Bil, Gayndah Line)—

To rid pigs of lice prepare a mixture of ½ pint of benzine, ½ pint kerosene, and 7 pints of waste oil. Mix well, and after washing the pigs to free them of accumulations of mud, &c., apply freely, either per hand or with a soft cloth or brush. Be careful to apply the oil inside the ears and around the head and neck, and in the wrinkles along the side. Otherwise a number of lice will escape and go on breeding. The very small white nits seen around the neck and shoulder of the pig are the eggs from which the young lice hatch out. Repeat the application of oil about ten days after the first treatment, and then periodically. Meantime clean up all old rubbish and cleanse pens thoroughly of all harbouring places, such as under bark and splinters of wood, old pig crates, &c.

Your system of growing plenty of green food and grain is the ideal one in profitable pig-keeping, and we feel you are on the right track in so doing.

It pays to provide oiling posts in the pig runs; a good stout post with a piece of sacking tacked about 12 to 18 inches from the ground is used. Keep the sacking or a piece of short woolled sheep pelt saturated with oil and the pigs will soon learn to oil themselves and keep themselves free from parasites.

Yes, it is an advantage to provide a mineral mixture, and several references to suitable mixtures are made in the pamphlets. Corn, sweet potatoes, and milk, plus greenstuff like rape and barley, lucerne, succulent grasses and herbage, plus minerals and drinking water will provide ample material for a balanced ration.

Top dressing the pastures will prove a distinct advantage and be well worth the expense incurred.

It is good to know you so much appreciate the various articles that have appeared in the Journal; the objective is to make the publication as informative and interesting as is possible.

Pig Food a Profitable Investment.

T.A.C. (Wamuran)—

We suggest you grow as much of the food as is possible, for only in this way can pigs be made a profitable investment on Queensland farms.

The articles that appear regularly in the "Queensland Agricultural Journal" on Farm and Garden crops are well worth close study, while the Agricultural Instructors will send along specialised information, on request, re any particular crop.

Pig Management.

R.R. (Kin Kin)—

We would suggest getting rid of unsatisfactory strains of pigs and replacing them with healthy well-developed stock, for good stock can be procured at reasonable rates and they would give you a good start again, but they would need to be kept in good grazing paddocks and be fed liberally, and carefully attended to. Possibly the trouble you refer to may also be due to the pigs suffering from constipation or bowel disorders or to bush tick poisoning; these diseases producing symptoms similar to those to which you refer. These troubles are all referred to in the pamphlets. We suggest you should give your pigs a complete change of food, turn them out into grassy runs, and be sure they have a warm dry bed at night. Feed milk and similar foods in a warm condition until the animals recover, and keep plenty of succulent greenstuff before them. Give charcoal and other mineral matters like bone meal, and follow advice given in the pamphlets re the regular use of mineral matters. Pigs of all ages require ample supplies of drinking water at all seasons of the year. Examine the pigs for lice and ticks, and if they are infected follow advice given re the use of oil, &c., for freeing the body of lice. The trouble is entirely constitutional and dietetic and must be handled carefully. We feel sure if you take this matter up in earnest and give it close attention you will have good results.

FRUIT CULTURE.

Citrus Pruning.

G.D. asks:—When pruning and cutting big limbs from orange trees, what would you advise to put on the cuts to prevent dry rot? I have heard that cold tar meets the case, but would like to have an opinion on it.

The Director of Fruit Culture, Mr. George Williams, advises:—Where big limbs are cut out of orange trees, provided the cut is made as nearly parallel to the stem or limb from which it is detached, there is no occasion to apply any preservative to the wood. The cut surface should be evenly pared, particularly around the edges, with a sharp paring chisel.

Lameness in Cattle.

"INQUIRER"—

Lameness in cattle is caused by overgrowth of the horn of the hoof, mud-balling, or other irritation caused by foreign bodies in the hoof cleft. Do not allow the toes to become excessively long or turn inwards or outwards. Remove excessive horn growth with a rasp or sharp-cutting pair of pinchers.

Foul foot of cattle is caused by a specific bacillus, and the predisposing factor for this condition is muddy yards, waterholes, and around drinking troughs. Recovered cases are carriers of this trouble, and care should be taken to pave all likely places and keep carriers out of muddy yards. The bacilli gain access to the feet through cuts or bruises between the clefts of the feet.

A proper foot bath should be constructed in one of the bails, 6 feet long, 3 feet wide, and 6 inches deep, sloping in on all sides, and the cows bailed up in this bath for a few hours daily, fed and watered and kept out of the mud.

The solution for the bath consists of 1 oz. of phenyle to 1½ gallons of water, preferably rainwater.

In the case of one or two quiet animals being affected, a foot bath, made out of a kerosene tin cut and the edge turned over, would suit the purpose.

The following solution may be used for soaking the foot:—Phenyle, 1 oz. to 2 gallons of rainwater. Soak for one hour morning and evening, and keep the animal in a dry paddock out of the mud.

Poisoning Weeds on Earth Tennis Court.

C.C.R. (Jondaryan)—The Director of Agriculture, Mr. H. C. Quodling, advises:—

With reference to the poisoning of weeds on an earth tennis court, and also on a garden path, the use of Sodium Chlorate is recommended for both purposes. You are advised to communicate with the A.C.F. and Shirleys Fertilizer Company, Roma street, Brisbane, for particulars of this poison and for information in respect to the methods of application. Arsenical compounds are not recommended for use on tennis courts or garden paths for killing weeds.

AN ENGLISH PIG BREEDER'S APPRECIATION.

The Manager of the Baydon Herd of Large Black Pigs, Marlborough, Wiltshire, England, writes:—

"Many thanks for the pamphlets and leaflets on the subject of Pig Raising and for the Agricultural Journal; they are all very interesting, and I like the way you have placed your suggestions in the various breeds, ailments, and systems of management before your farmers.

"You are in front of us in England in the practical way you try to induce your farmers to keep the best in the best manner. I think your pamphlet on 'Paralysis of the Hindquarters in Pigs' is exceptionally good. The illustrations convince the most 'pig-headed' people."

General Notes.

Amendment to Honey Board Levy Regulations.

On the 21st August, 1930, Regulations were passed empowering the Honey Board to make a levy on honey growers to provide for the administrative purposes of the Honey Board. This levy is at the rate of 1½ per cent. on the proceeds of all honey sold from the 23rd August, 1930, to the 22nd August, 1931. As the Board applies also to beeswax, these Regulations have now been amended to apply also to all sales of beeswax in Queensland during that period. Thus the levy will now be at the rate of 1½ per cent. on the proceeds of the sales of all honey and beeswax in Queensland.

Staff Changes and Appointments.

Mr. W. E. C. Smith has been appointed Canegrowers' Representative on the Invicta Local Sugar Cane Prices Board, vice Mr. P. Hayes, resigned. Mr. G. R. Bush, of Maroochydore, has been appointed an Honorary Ranger under and for the purposes of the Animals and Birds Acts.

The transfer of Mr. M. Custance, Inspector of Slaughter-houses, Townsville, has been cancelled, and Mr. M. Flanagan, Inspector of Slaughter-houses, Bundaberg, has been transferred to Warwick instead of to Townsville. Mr. J. Bishop, Inspector of Stock, Nanango, has been transferred to Kingaroy, and Mr. T. Douglas, Inspector of Stock, Kingaroy, has been transferred to Nanango. The headquarters of Mr. L. D. Carey, District Inspector of Stock, have been transferred from Emerald to Springsure. The Officer in Charge of Police at Mungana has been appointed an Acting Inspector of Stock, and the appointment of the Officer in Charge of Police at Alma-den as an Acting Inspector of Stock has been cancelled.

The appointments of Messrs. L. L. S. Barr and A. J. Browne as Agents under the Banana Industry Protection Act have been cancelled, and, in lieu thereof, Messrs. J. C. Wilson and B. Funnell have been appointed Agents for the Banana Board.

Mr. J. T. Tod has been appointed Chairman of the State Wheat Board for a period of two years from the 1st September, 1930, to the 31st August, 1932.

Mr. Harry Hayward, of Maroochydore, has been appointed an Honorary Ranger under the Animals and Birds Acts.

The Officers in Charge of Police at Forsayth, Georgetown, and Mount Surprise, in North Queensland, have been appointed Acting Inspectors of Stock as from the 30th August, 2930.

The following persons, all resident in the Innisfail and Tully districts, have been appointed Honorary Rangers under the Animals and Birds Acts as from the 30th August, 1930, for the purpose of protecting bird life in the canefields in those districts:—

Messrs. W. D. Davies, R. C. Lacaze, J. F. McCutcheon, S. Pagano, J. Valmadre, F. H. Gilmore, G. Myers, S. J. French, P. White, P. Volp, H. G. Knust, J. B. Skardon, T. O'Loughlen, H. H. Allison, P. F. Tierney, W. J. Burke, E. R. Campbell, A. F. Marty, J. T. McNamee, W. A. McRobbie, D. V. Woods, S. Theodore, H. Henry, G. Wilson, J. C. Proctor, H. Brannigan, G. F. Brett, and W. Moran.

Levies on Banana Growers.

On the 21st August two Orders in Council were issued providing for levies on growers of bananas to provide for the administrative expenses of the Banana Board and of the Banana Experiment Stations at Kin Kin East and Bartle Frere. The levy for the Banana Board was made at the rate of 1½d. per case containing 1½ bushels or less, and at the rate of 1½d. per three bunches of cavendish, five bunches of lady's finger, or six bunches of sugar bananas marketed by the growers, according to the method of marketing employed. The levy for the Experimental Stations was made at half the above rates.

The levies on bananas marketed in the bunch have been found to be unfair to the growers owing to the great differences in size and quality of the bunches marketed, and hence to the great differences in prices obtained for single bunches. These original Orders in Council have, therefore, been amended in so far as the levy on bananas marketed in the bunch is concerned. Therefore, from now on, the levy on bananas marketed in the bunch will be at the rate of twopence (2d.) in the £1 sterling on the proceeds of all sales as regards the Banana Board, and at the rate of one penny (1d.) in the £1 sterling as regards the levy for the Experimental Stations. The levies of 1½d. and ¾d. per case for bananas sold in the case still remain.

Barley Board Hail Insurance Regulations.

Regulations have been passed under the Primary Producers' Organisation and Marketing Acts to provide for a hail insurance scheme for the Barley Board. This scheme is almost identical with that operated by the State Wheat Board.

Two funds are to be established—a Hail Insurance Fund and a Hail Insurance Reserve Fund. The first, the Hail Insurance Fund, will be created by a levy in the form of a pro rata premium charge against all growers calculated on the basis of the quantity of barley harvested, and that on which Hail Insurance Compensation is payable each year. The levy will be a charge against the grower, and may be a deduction from advances, but the sum chargeable in any one year shall not exceed 7½ per cent. of the total value of the barley insured during the same year.

The Hail Insurance Reserve Fund will be created by a levy by the Barley Board on all growers of barley at the rate of one halfpenny (½d.) per bushel on all barley harvested in Queensland. This Reserve Fund will be limited to £2,000, and when that amount is reached no further levies will be made, except to recoup the fund when payments have been made therefrom.

Each of these levies is open to a poll as to whether they shall be made or not. If no petition is received the levies will automatically come into operation. If a petition is received a ballot will be held, and if the majority of those voting is against the levies such levy shall not be made. "Growers" for the purposes of these ballots will be persons who, at any time during the last twelve months, harvested for sale barley produced in any part of the State of Queensland.

Pineapple Levy Regulations.

The Pineapple Levy Regulations which have been in force since 1926, and which were to apply until the 24th January, 1931, have been rescinded, and new ones inserted in lieu thereof. These new Regulations will apply only for a period of one year from the 20th September, 1930—that is to say, until the 19th September, 1931. The means of collection of the levies remain unchanged, the only differences being in the amount of the levies and the methods in which they are to be expended. The old levy was at the rate of one halfpenny (½d.) per case of pineapples in containers, per forty-two rough or Ripley pineapples or per twenty-four smooth pineapples in instances where they were sold loose. From now on the levy will be at the rate of twopence (2d.) per case of pineapples sold in containers, or, in instances where pineapples are sold loose, at the rate of 2d. per forty-two rough or Ripley pineapples or per twenty-four smooth pineapples. This applies only to pineapples sent for ordinary domestic consumption. In the case of pineapples sent to any canner or fruit preserver, the levy will be at the rate of twopence halfpenny (2½d.) per case for every case of pineapples with "tops on," and three and one-third pence (3⅓d.) per case for every case with "tops off."

Approximately three-quarters of these levies will be expended to meet any possible losses incurred in sending overseas any processed pineapple products processed by or with the authority of the Committee of Direction. The balance of the levy will be expended only in the interests of the pineapple section of the fruitgrowing industry of Queensland.

The amended levies have the approval of the majority of the pineapple-growing districts of the State.

The Public Curator Office—Another Record Year.

The Balance-sheet and Profit and Loss Account of the Public Curator Office as at 30th June, 1930, shows a net profit of £8,491 0s. 11d. This constitutes a record profit since the inauguration of the Office on the 1st January, 1916. The accumulated surpluses now amount to £59,125 10s. 2d. As the Office is guaranteed by the Government, it will be noted that this reserve is available to make good any losses before the Government would be asked to honour its guarantee. The total cash receipts for the financial year amounted to a little over a million and a-quarter pounds sterling. In the year 1916 the cash receipts totalled slightly over a-quarter of a million pounds sterling only. These figures speak in concrete terms of the great growth of the Office over a period of fourteen years. This rapid increase may be accepted by the people of Queensland as genuine evidence of their appreciation of the benefits offered to them by the Public Curator Office.

The phrase "The People's Executor and Trustee" is an appropriate slogan used by the Public Curator, because his activities are purely in the interests of Queenslanders, and their benefit and consideration are his main desire. The handling of thousands of estates and individual trusts raises problems of a very special nature

very different from those arising out of a strictly commercial business. Apart from the question of safety (which, of course, is undoubted), not the least among these problems, is the assuring of the efficient and personal attention to which each estate is entitled. That this aim has been attained is very evident by the very large number of messages of appreciation and congratulation that have been received from time to time from satisfied beneficiaries and clients. Though to err be human, the Public Curator never passes on the cost of a mistake to his clients. The Office makes good its own errors.

As the Public Curator is a corporation sole, he runs his Office on purely business principles without interference in any way by the Government which happens to be in power at any time. This makes for public confidence, because no part of the public moneys is used in the payment of salaries or in the general upkeep of the Office, which is entirely self-supporting, and which is not in the slightest degree a charge on the general revenue of the State. The expenditure on the salaries of 180 officers alone amounts to £45,000 a year, or an average of £250 a year per officer. In 1916 the number on the staff was 39. In that year the investments amounted to £97,000. In 1929 they amounted to £1,020,776.

Banana Board Election.

On the 27th February last Regulations were passed under the Banana Industry Protection Act providing for the election of growers' representatives on the Banana Industry Protection Board. These Regulations, numbered 27 to 37, inclusive, have been rescinded, and new ones have been substituted therefor. The old regulations have been altered in several respects, of which the chief are as follows:—

The present Banana Board, consisting of two representatives of the Minister and two representatives of the growers nominated by the Committee of Direction of Fruit Marketing, will continue in force until the 30th September, 1931. The Board was due to expire on the 31st August, 1930, but, by means of such extension, no election will be necessary until 1931. The growers' representatives for each district (of which there are two, the same as formerly) must be nominated by growers resident in that district only, and no person shall nominate for more than one district.

All elections will be by preferential voting; under the old Regulations the voting was not to be preferential.

In the event of any vacancy on the Board caused by the death, retirement, or resignation of any member, the Minister may now either appoint some person qualified to vote at elections of the Board to fill the vacancy, or else order an election. The person so appointed or elected will hold office only until the time of the next general election of members of the Board.

There will be a separate election for each of the two districts, instead of one general election for the whole of Queensland as under the old Regulations.

Tomato Marketing.

On the 31st July last the Committee of Direction issued a Direction relating to tomatoes to come into operation as from the 15th September, 1930, to the 15th December, 1930. Petitions were sent in from various districts asking that an Order in Council be issued by the Governor in Council declaring that the tomatoes to which the Direction relates shall be acquired by the Committee of Direction as the owners. A ballot was accordingly held by the Committee of Direction, with the result that 68.85 per cent. of the votes polled were in favour of the acquisition. As the required majority of 60 per cent. in favour was obtained, an Order in Council has now been issued giving effect to the wishes of the growers.

The Order applies only to tomatoes grown in the Petty Sessions Districts of Maroochy, Caboolture, Esk, Woodford, Kilcoy, Redcliffe, Brisbane, Cleveland, Southport, Logan, Beaudesert, Wynnum, Goodna, Ipswich, Marburg, Laidley, Lowood, Harrisville, Dugandan, and Rosewood—briefly, the district bounded on the north by Nambour, on the south by the New South Wales border, and on the west by Rosewood, and including the islands in Moreton Bay. All tomatoes produced for sale in this area during the period of about three months from the 20th September, 1930, to the 15th December, 1930, shall be acquired by the Committee of Direction as the owners thereof. The Committee of Direction has the power to do such things as it thinks necessary for the purpose of enabling it to effectively carry out the marketing of such tomatoes as the owners thereof for and on behalf of the growers, and the only purpose for which it intends to use this power is to prevent the despatch to the Southern States of immature tomatoes. Any interstate contracts which had been entered into prior to the date of this Order will not be prejudiced by the acquisition. The Order will remain in force only from the 20th September to the 15th December, 1930.

Filing Crosscut Saws.

The work of sharpening crosscut saws is greatly facilitated by marking off the correct tooth angle, which is 30 deg., on the top of the saw clamp at 1-inch intervals. If the file is kept parallel to the marks while filing the saw the angle of the teeth is sure to be correct.

Codling Moth Control.

Fruitgrowers generally, and apple and pear growers in particular, will be interested in the result of an experiment carried out by the Horticultural Division of the Victorian Department of Agriculture on the trees of two orchards in the Doncaster district.

The trees were sprayed six times, the first spray consisting of 2½ lb. of arsenate of lead powder and 1 lb. of spreader, with 80 gallons of water. A week later a second spraying of 2½ lb. of arsenate of lead with approximately 3 quarts of Volck white oil and 1 lb. of spreader to 80 gallons of water was given. This was repeated three weeks later, and again three weeks after that. The fifth spraying, a little over a month later, consisted of 1½ gallons of Volck with 1 lb. of spreader to 100 gallons of water, and this mixture was again sprayed another month later as the sixth and final spraying.

The results on the apples particularly were outstanding. The fruit matured ten to twelve days before fruit on other plots not treated. The skin was very much brighter, cleaner, and more highly coloured. A careful check of the fruit when picked disclosed the fact that only a fraction over 1 per cent. of the fruit was infected, leaving practically 99 per cent. absolutely clean and free from infection. One of the big advantages of the late spraying with Volck is the absence of residue on the fruit when picked, thus eliminating the necessity of wiping the fruit.

The experiment brought to light the fact that Volck seems to repel the moth, or at least prevents it from recognising its hosts, as it was noticeable that fewer eggs were deposited on the fruit that had been sprayed with Volck.

Another conclusion come to by the experimenters was that an oil-arsenate spraying, such as arsenate of lead and Volck, controls scale insects and red spider as well as codling moth.

The result of this test, scientifically conducted by experts, points the way to the successful control of codling moth, which is an ever-increasing pest in this State. Growers interested in Volck white oil can obtain full information about it from the Queensland distributors, A.C.F. and Shirley's Fertilizers Limited, Brisbane.

Peanut Board.

On the 29th May last a Notice of Intention to make an Order in Council constituting a Peanut Board to apply to all peanuts produced in Queensland was issued. A ballot was held on the question of whether it should be made or not, and this ballot resulted with 346 votes in favour and 62 against the Pool, giving a majority of 84.8 per cent. in favour. An Order in Council has therefore been issued constituting a Peanut Board for ten years to apply to all peanuts produced for sale in Queensland.

All peanuts produced for sale in Queensland are to be a commodity, and will be divested from the growers and become the property of the Board as owners. All peanuts must be delivered to the Board in an unshelled condition, and a grower shall not remove any of the peanuts produced by him from his premises, except for delivery to the Board or its agents, unless the prior consent of the Board has been obtained.

The Board will consist of four elected representatives of the growers and the Director of Marketing or a deputy appointed by the Minister. The following have been appointed members of the new Board:—Messrs. F. C. Adermann (Wooroolin) and A. S. Clark (Sandhills), until the 27th August, 1931; and Messrs. F. G. Petersen (Kingaroy) and A. G. Whiting (Atherton), until the 27th August, 1932.

Persons entitled to vote at any referendum or election in connection with the Board shall be those who have produced peanuts for sale in Queensland at any time during the twelve months immediately prior to such election or referendum.

The old Peanut Board now goes out of existence, and this new Board takes over all the assets and liabilities of the old Board. The new Pool will last for ten years—that is, until the 27th August, 1940. The existing Peanut Board Levy Regulations dealing with levies to provide for storage facilities, &c., shall continue to be operative during the currency of this new Pool.

Fertiliser Facts.

Each succeeding crop that is grown lessens the fertility of the soil. That is a fact in nature that has been proved by the chemist, who can determine the proportions of nitrogen, P_2O_5, and K_2O present in the stalk and leaves of each variety of plant, and can thus calculate the total amount of those elements removed by each acre of crop. An average yield of sugar-cane, for example, removes 60 lb. of pure nitrogen (equal to 300 lb. ammonium sulphate), 50 lb. of phosphoric acid (equal to 240 lb. of superphosphate), and 140 lb. of pure potash (equal to 280 lb. of muriate or sulphate of potash).

This plant food has then served its purpose as nature intended. Like the coal that is mined and used for industrial purposes, it has performed its duty; but the soil, just as the coal mine, has, in consequence, lost a definite portion of its store of wealth.

Apart from the chemists' determinations, the falling off in the soil's fertility can be observed, in the case of land that has been long under cultivation, by the poorer crop yield.

Owing to the patient experimental work of eminent scientists, more particularly those of the last century, this steady decline in the fertility of cultivated land can be arrested by the application of artificial fertilisers.

The practice of fertilising sugar-growing land has become well established in Queensland, and the expenditure on fertilisers is one of the regular items of cost in the production of sugar-cane—a cost, however, that produces a substantial increase in the value of the crop. The price of this commodity has been falling steadily for over a year past, and a further reduction of 35s. per ton in the price of sulphate of ammonia and a consequential reduction in the price of mixed fertilisers has been announced by Messrs. A.C.F. and Shirleys Fertilizers Limited.

It is announced that mixtures and sulphate of ammonia are now lower in price than ever before. It is to be expected that the lower prices will encourage heavier applications to the land, as we are not yet using nearly sufficient to replace the annual wastage of plant food that is removed by the crop and is lost in other ways. Systematic fertilisation plus good farming methods point the road to ''more money per acre.''

Ray-therapy for Pigs.

Referring to an account of experiments in ray-therapy which have been carried out over a period of three years at a Hertfordshire farm, the ''Morning Post'' says: ''Little pigs have been sent to market four weeks earlier than usual, their lives having been shortened, but at the same time made merrier, by intensive light treatment from tungsten arc lamps. Potential bacon was artificially increased in some cases at the rate of 3 lb. a day.''

The report of the experiments states that experiments with ultra-violet rays in connection with farming are being carried on by Mr. J. O. Hickman, at Micklefield Green, Hertfordshire.

Mr. Hickman has also found that ultra-violet rays, applied for a few seconds before milking to the udders of his cows, have greatly reduced the bacteria in the milk. The subsequent irradiation of the milk still further reduced the bacteria content, enabling it to be kept fresh for a much longer period. At the same time it added to it the valuable vitamin D, the anti-rickets vitamin, without destroying the equally valuable vitamin A.

Beef Consumption in the United States Falling Off.

Per capita consumption of beef in the United States was 12 lb. less, while pork consumption was 8 lb. more during 1928 than in 1926, the State and Federal Division of Agricultural Statistics reported recently.

Total meat consumption, which has been steadily declining for years, dropped from 145 lb. per capita in 1926 to 139 in 1927, and 138 lb. in 1928, the report said.

''The yearly kill of beef in 1926 was the largest in history, and it has dropped severely since that year, when the average person ate 63.6 lb. of beef plus 8.2 lb. of veal,'' the report continued. ''Last year beef consumption in the United States was only 51.7 lb. per capita, and veal consumption only reached 6.8 lb.

''Lamb and mutton apparently have become more popular, the amount eaten by each person changing from 5.5 to 5.6 lb. in the last two years, but this still leaves lamb as only 4 per cent. of all meat eaten in America. In England it makes up more than 20 per cent. of the meat diet.''

Effect of Lack of Minerals in Stock Foods.

It has been emphasised on many occasions in these columns that in practically every district throughout Australia there is an urgent necessity for the addition of mineral matters to the diet of farm stock, particularly pigs. In the absence of or deficiency in the daily supply of these very necessary additions to the diet of the animals, numerous abnormal conditions are likely to develop, and among these might be mentioned rickets, one of the most frequent and important of the diseases due to mineral deficiency. In this condition, which occurs pricipally in pigs under twelve months of age, the bones, instead of becoming strong, hard, and able to stand the strain of increasing weight, remain soft and comparatively pliable and frequently enlarged at their extremities (the joints). The trouble is more likely to occur where the animals are housed in small, dark, and badly ventilated sties, where, in addition to improper diet, they are not permitted free range or very necessary exercise in the sunshine. Deficiency in the vitamin content of the food exaggerates the condition and exaggerates other evils.

Such animals are, of course, unthrifty and, not being able to stand up to the strain imposed on their bony structure, fall a prey to hog lice, intestinal worms, skin diseases, &c., all of which result in slow and unsatisfactory growth and loss of profit.

Strangely enough, crops grown on soils which are deficient in minerals also suffer in that they are not chemically complete, while the grain and resultant meals prepared from crops grown on these soils are also weak in mineral content. Where in-pig sows are fed on poor country and where their feed is improperly balanced or deficient in chemical content, it is possible they will produce one or more pigs dead at birth, or only half developed, or very weak and puny and unable to fend for themselves. The rickety pigs are weak and are liable to become crippled at the least strain. Pigs suffering from rickets are not as resistant to the more serious diseases as are pigs strong and robust, nor are the sows likely to rear their litters satisfactorily. The only way to overcome these troubles is by cleaning up the surroundings, improving the housing and accommodation, correct feeding, and by the addition to the daily food supply of mineral matters like ground limestone, wood ashes and charcoal, sterilised bone meal.

A suitable mineral mixture may be compounded from the following recipe:—

Salt	20 lb.
Ground limestone	40 lb.
Sterilised bone meal	40 lb.
Ferric oxide	5 lb.
Potassium iodide	3 oz.

This mixture should be carefully prepared, thoroughly mixed, and be placed in a suitable trough protected from the weather and placed in such a position that the pigs can have free access to it at any time. Care and attention and improved methods of management are the only remedies for rickets.

Mr. Chris. Sheehy—An Appreciation.

Thus the "Queensland Producer":—The work of the Secretary of the Council of Agriculture (Mr. Chris. Sheehy) is deserving of special mention. During the past year he has been untiring in his efforts in not only furthering the objectives of the Queensland Producers' Association, but has also done a vast amount of useful work designed to promote the welfare of the producer. Mr. Sheehy has not spared himself in any way, and there is not the least doubt his heart is in his work.

He is a veritable mine of information concerning every detail of the Q.P.A. activities as well as the primary industries of the State and Commonwealth. His task is a very onerous one, but he has brought to it exceptional natural ability and a great capacity for hard work. These, combined with his unfailing courtesy and tact, have contributed much to his outstanding success as secretary of the organisation.

[Mr. Sheehy was formerly a valued officer of the Department of Agriculture and Stock, and in the early days of the organisation was seconded for service as assistant secretary to the Council of Agriculture. On the later reorganisation of that body he was appointed secretary, also secretary of the Queensland Butter Board.—Ed., "Q.A.J."]

The Return of the Horse.

The increased number of motor-cars on the road has not banished the horse by any means, and it is cheering to know that horse transport is more than holding its own, despite the increased competition of mechanical transport. It is calculated that there are still over 3,000,000 used for business purposes in the country, over 1,000,000 of which are used in agriculture. The horse has been found to compare very favourably with mechanical transport in cost and maintenance, with the result that many firms and public bodies have rediscovered the value of the horse. We referred recently to the testimony of the railways, and their experience is confirmed by the use of horses by the transport departments of municipal authorities and the larger co-operative societies.—"Live Stock Journal" (England).

Pasture Improvement—A New Zealand Example.

Agriculturists who visited New Zealand could not fail to appreciate the remarkable results achieved there in pasture improvement, stated the Agrostologist of the New South Wales Department of Agriculture in the course of a recent address. It must be remembered, however, that the climatic conditions existing throughout the greater part of New Zealand were of such a nature that no difficulty was experienced in establishing and maintaining succulent pastures of Rye Grass, Cocksfoot, and Perennial Red and White clovers—four of the recognised world's best pasture plants.

Our hot summer weather and more or less uncertain summer rainfall were detrimental to Rye grass, and consequently it was difficult to maintain this grass in a productive state in districts such as the far North Coast, said the speaker, but much could be done with our coastal pastures as they existed to-day in the subdivision of paddocks into smaller areas in order to obtain better control of pasture growth, the application of suitable fertilisers, the use of grass harrows, the scattering and working in on paspalum pastures of seed of the winter grasses and clovers recommended for various districts by the New South Wales Department, and the conversion of surplus pasturage into grass silage or grass hay. Work along these lines was in operation at Berry and Wollongbar Experiment Farms, in addition to smaller trials at representative centres from the Tweed River to the far South Coast.

The main reasons why New Zealand could produce and maintain a supply of sucker lambs suitable for export were:—

1. The excellent pastures available, and climatic conditions which were conducive to the best growth of English grasses and clovers.
2. Sheep of the highest quality were the only types used in the production of export lambs.
3. Freezing works were numerous and were located in the main lamb-producing centres.

Regarding dairy stock, too, one of the most notable features was the excellent standard of animal on the farms.

It had been recognised many years ago in New Zealand that the grading up of the pastures was absolutely essential in order to produce early-maturing lamb or beef and to maintain milking cows in a state of high production. In 1914, 40,000 tons of fertilisers were used for top-dressing pastures, whereas in 1928-29, 315,000 tons were applied to 2,385,182 acres. The area of sown grasses and clovers in the Dominion was over 16,000,000 acres.

In all of the main dairying centres good pasture management was adopted. The subdivision of paddocks into areas of from three to six acres being a special feature of the work. Excess grass growth was controlled by the use of the mowing machine, and the cut material was made into grass silage or grass hay. The aim of the dairy farmer was to have available short nutritious pasturage for the milking cows. The animals always had access to the best feed, and the general practice was to stock at the rate of about twenty cows per acre for about two days, the remaining feed being cleaned up by the followers (generally dry and young stock). The paddocks were then harrowed with special grass harrows to spread the animal droppings and aerate and scarify the surface soil.

The main essential before commencing a system of intensive grazing in the dairying districts of Australia would be to build up reserves of grass silage, maize or sorghum silage, or grass hay as a standby for dry periods and to meet the shortage of feed which generally occurred on pastures in the winter months.

The Newspaper.

"What strikes me more and more about readers is their ingratitude. People grumble at the newspapers, but what would those grumblers do if they could not get their newspapers? I cannot help thinking a lot of nonsense is said about the so-called defects of the Press. I prefer to think of its wonderful achievements, its immense variety, and the wealth of ability bestowed upon it."—Lord Hewart.

Road or Rail—Motors as Feeders to Long-Distance Railways.

Although there are those that believe that eventually the railways will be converted into motor tracks, it is much more likely that under proper organisation the railways eventually will come into their own, as carriers for all long-distance traffic other than that of an exceptional nature, such as goods too bulky to be transported by rail. The problem is one that will be difficult of solution, especially in Australia with its wide spaces.

Commenting upon this subject London "Engineering" says that no arbitrary definition can be given of long distance traffic, but given effective regulation of road undertakings it is probable that, in general, either goods or passengers can be more conveniently and economically carried by rail over distances much in excess of fifty miles. So far as passengers are concerned, greater distances by road tend to become slow and tedious as compared with rail travel. The matter is on a different footing as regards goods traffic, as in this case a balance must be struck between economy and speed. It may be admitted that at the present time, goods can often be carried more than twice the stated distance more cheaply and expeditiously by road than by rail, but, on the whole, the tendency is for the cost of road transport to increase, and that of rail transport to decrease, and we believe that the English railways are now fully alive to the importance of eliminating vexatious delays by speeding up collection and delivery, and the elimination so far as possible of idle time at depots. If we are correct in our surmise, the proper function of road traffic becomes that of acting as a feeder for long-distance rail traffic, and providing local services up to distances of about fifty miles, particularly in the direction of cross-country runs. Such a programme leaves ample scope not only for the existing road carriers, but adequate provision for expansion.

"Big Fleas have Little Fleas——."

How a ruthless war against insect pests in every part of the Empire is being directed from a headquarters in a Buckinghamshire village is described in a report issued recently by the Empire Marketing Board ("The Biological Control of Insect and Plant Pests"). A converted country house at Farnham Royal, near Slough, is used as a clearing station and breeding centre for "beneficial" insects. These are despatched to the Dominions and Colonies to attack their harmful brothers, who cause an enormous annual loss to plant and animal life. The good insects are parasites, and control the bad insects by laying their eggs in or on the pest's grubs and eggs, and then by feeding on them. In the three years of its existence, the "Parasite Zoo," as the laboratory has been called, has been asked by Dominion and Colonial Governments to investigate some seventy different kinds of insect and weed pests in the hopes that parasites might be found.

Damage done by insects is extremely costly. Blowflies, for instance, annually destroy about 5 per cent. of the sheep population of Queensland, and have been estimated to cost Australia £4,000,000 a year. The wheat stem sawfly did £2,500,000 worth of damage in 1926 in one province alone. America suffers so severely that a sum of no less than £2,000,000 was recently spent by the Government in one year in an effort to check the advance of a single insect, the European corn borer. This borer is now advancing into Canada. The United States has recently spent no less than £12,000,000 in fighting five insects.

Shipments of some twenty different kinds of insects have been sent overseas, generally in cold storage, in special cases with food such as raisins, or sugar and water, for rations. Fourteen consignments of a parasite which attacks woolly aphis have been distributed in England, India, and Kenya Colony. This has succeeded in practically exterminating woolly aphis in New Zealand. Parasites of the wheat stem sawfly, the whitefly, and the pine shoot moth have gone to Canada; one which attacks the sheep blowfly has been shipped in large quantities to Australia and South Africa; a Californian ladybird has gone to Madras; a miniature wasp which eats the pear slug has gone to New Zealand, and a bollworm to the Barbadoes. In all, a total of about fifty-eight shipments, comprising some 100,000 specimens, have been shipped from the laboratory to various parts of the Empire.

An Important Factor in Farm Profits.

The farmer generally pays more attention to the price of his products than to the cost of producing them, but the prices of those commodities sold on a world market—wheat, wool, butter—are largely uncontrollable by him, points out Dr. A. E. V. Richardson, in the South Australian "Journal of Agriculture." On the other hand the costs of production, within limitations, are subject to the farmer's control. Various items entering into production costs are virtually fixed; these include taxes, land capital costs, upkeep and certain general expenses. But the major costs of production, excepting only land capital costs, are not fixed—they vary with the intelligence and skill of the farmer, and the power and equipment he applies to them. It is in the preparation of the land, seeding, tillage, cultivation, harvesting and hauling of the crops that the major expenses are incurred, and to the degree to which these can be reduced the profits of the farmer can be increased.

Progress in Empire Buying.

Evidence of the growth of Empire buying in the United Kingdom is contained in the annual report by the Empire Marketing Board.

The purpose of the Empire Marketing Board is clear and definite. It is to improve the quality and increase the quantity of Empire products marketed in the United Kingdom and to make Empire buying a national habit. From this centre radiate all the diverse activities of the Board. The scientist at his laboratory table serves its central purpose no less than does the salesman at his shop counter.

No amount of persuasion brought to bear upon the consuming public in all its forms would succeed unless it was supported by the wholesale and retail traders. The Board has accordingly endeavoured to secure the fullest co-operation of all kinds of traders concerned with Empire marketing.

The year has seen a steady extension, on the marketing side, of the services provided by the Board. The rise of the "National Mark" as a factor of prime importance in placing home-grown foodstuffs on an orderly marketing basis has been actively assisted by the Board. The direct initiative and responsibility for the "National Mark," as for all schemes for improving the condition of agriculture in the United Kingdom, falls, of course, on the Ministry of Agriculture and the Scottish Department of Agriculture. The Board has co-operated with these departments by providing the necessary funds, as well as by advertisement and other channels of publicity. In all its activities the Board has continued to put first the interest of the home producer.

Cultivating the Fallow—The Implements to Use.

The implements that should be used in working the fallow depend very much on the nature of the soil and the state of the fallow. If the soil is medium to heavy loam and is free from weeds the harrows or springtooth cultivator would serve. If semi-alluvial brown loam, light red loam, or heavy black self-mulching soil, and free from weeds, the harrow would be the most suitable implement. If heavy red loam or clay country, or if weeds are prevalent, the rigid tine scarifier should be used. The determining factor is usually the amount of weed growth. It is often possible to deal very effectively with weeds when very young by the use of the harrows, but should weather conditions and other factors delay the working until the weeds are too big, the rigid tine cultivator with suitable points will put the fallows in excellent condition.

The rigid tine cultivator or scarifier is the most satisfactory implement for most classes of soil. Compared with the springtooth—because it can be set to the desired depth—it does much more uniform work, makes a more even mulch, and leaves the top of the compacted subsurface area level, not ridged. This makes for a much more uniform condition of the fallow generally, and results in a more even crop. With the correct points, or fitted with knife bars, it can deal much more effectively with weed growth, particularly thistles and melons; it has not, however, the sifting action of the springtooth, and should not displace it for the early cultivations.

The disc cultivator is without doubt the best implement of all to put the fallow in bad condition. Admitting its value in destroying large weeds, it is evident that these could almost always have been killed while quite small by the use of other implements. Large weeds are a sign of a neglected fallow. Deep discing ruins the compacted sub-surface layer, delivering the clods to the bottom and fine soil to the surface, where it is easily crusted by the first rains. As discing is usually carried out in January or February, not only is the whole physical condition of the fallows practically ruined, but rapid evaporation of moisture results, and there is not sufficient time to restore consolidation unless special means are devised, and they very rarely are.—A. and P. Notes, N.S.W. Dept. Agric.

Why the Boy Leaves the Farm.

Why did you leave the farm, my lad? Why did you bolt, and quit your dad? Why did you beat it off to town and turn your poor old father down? Thinkers of platform, pulpit, press, are wallowing in deep distress; they seek to know the hidden cause why farmer boys desert their pa's. Some say they love to get a taste of faster life and social waste. Some say the silly little chumps mistake the suitcase cards for trumps, in wagering fresh and germless air against the smoky thoroughfare. We've all agreed the farm's the place, so free your mind, and state the case.

Well, stranger, since you've been so frank, I'll roll aside the hazy bank, the misty cloud of theories, and show you where the trouble lies. I left my dad, his farm, his plough, because my calf became his cow. I left my dad, 'twas wrong, of course, because my colt became his horse. I left my dad to sow and reap because my lamb became his sheep. I dropped my hoe, and stuck my fork, because my pig became his pork. The garden truck that I made grow, 'twas his to sell and mine to grow. It's not the smoke in the atmosphere nor the taste of life that brought me here. Please tell the platform, pulpit, press, no fear of toil or love of dress is drawing off the farmer lads, but just the methods of their dads.—From an American journal.

Cultivation of the Fallow—Importance of Spring Workings.

Fallowed land contains its maximum amount of moisture in the spring, but evaporative agencies become increasingly active from this period onward, and if cultivation of the surface is neglected a steady loss of the stored moisture will take place.

In experiments at Longerenong Experiment Farm, Victoria, the moisture content of a worked and a neglected fallow was carefully ascertained at different depths every month. Certain land was ploughed and cultivated in September, one portion receiving no further cultivation, and the other being worked in the same way and at the same time as other fallow land in the vicinity. On 1st November there was already a difference in the moisture content, and by April the difference was marked, the neglected fallow having in the first 4 feet 27.16 per cent. of moisture, while the cultivated fallow had 32.71 per cent. As February and March were months of good rainfall, the difference in the top 4 feet was not as great as it would have been in a dry summer, but further tests showed that the rains referred to had gone a good deal deeper than 4 feet in the cultivated portion, and remained there to nurture the succeeding crop. Californian investigators found that while in uncultivated land there was 4.3 per cent. of moisture in the first foot of soil, in cultivated land there was 6.4 per cent., and continuing their experiments at every foot to 6 feet below the surface, they showed that the advantage was the same almost the whole way down.

Weeds also, of course, play their part in depleting a neglected fallow of moisture. They rob the soil also of plantfood, and spread their seeds to the detriment of the next crop.

Provided the soil has been ploughed when in good condition, it can with advantage be left some weeks in the rough state as broken by the plough. Recently ploughed land is covered with the most effective mulch possible, and even if the surface becomes somewhat caked, little is gained by working it in the winter. In this rough state, too, it readily absorbs moisture, permitting rain to penetrate into the subsoil, and loss of moisture by run-off is reduced to a minimum under these conditions. Moreover, a greater surface of soil is exposed to weathering agencies such as frost, air, and sun, which have a mellowing influence on the soil. As the soil begins to dry up in the early spring, however, it is necessary to break the surface to renew the mulch and begin the preparation of the seed-bed.

The actual amount of working the fallowed land will require will depend upon the climate and the condition of the soil. If the moisture is to be conserved, the soil must be stirred as soon as the effectiveness of the mulch is destroyed by rain; mulches are only effective when loose and dry. Even a light shower is sufficient, under some conditions, to render a mulch ineffective; and when this is the case the soil is often drier twenty-four hours after the shower than if no rain had fallen. This is due to the increased capillarity of the particles, caused by the wetting and consequent compacting of the soil, resulting in loss of subsoil moisture by evaporation.

Two things have to be kept in mind in the working of the fallow through the summer: first, the preservation of an effective surface mulch, and second, the preparation of a seed-bed that will afford the most favourable conditions for the germination of the seed and the growth of the crop. The actual manner of the cultivation of the surface, and the implements to be used for the purpose, differ considerably. On the great bulk of the soils in our wheat areas, especially on those

that tend to break up readily, the practice preferred by many farmers is to work the fallow first with the harrows and then with the springtooth cultivator to the full depth of the original ploughing. The effect is to bring the clods in the worked soil to the surface, while the fine soil is sifted to the bottom, forming a layer of a couple of inches of finely divided soil which readily becomes compacted and united with the subsoil.

By enabling the cultivation to be completed in a minimum of time, wide stretches of harrows are very useful for the first cultivation of the fallow in the early spring, when delay for only a few days may result in a very serious loss of soil moisture. They also prepare and pulverise the soil for the subsequent working with the cultivator.

On some of the heavier soils harrowing is sometimes advisable after ploughing, for if not worked down somewhat during the winter, while still moist, the clods are very hard to deal with later; they become dry and hard in the summer, and none of the ordinary implements are capable of breaking them down to smaller sizes. If such soils are harrowed down soon after ploughing many of the clods will be considerably reduced in size. When the soil is infested with the seeds of the wild oats it is an advantage to harrow after ploughing in order to encourage the early germination of the oat seeds.

On soils that set after rain and on which it is desired to maintain a cloddy mulch, it is not advisable to harrow after ploughing, as this practice helps to make the surface too fine without improving the condition of the soil below the surface.—A. and P. Notes, New South Wales Department of Agriculture.

Herd Testing as an Aid to More Profitable Dairying.

The main object of herd testing was to find out the cows that were not profitable, and by breeding, feeding, and culling to increase the average production of the herd, explained Mr. E. P. Filmer, at a recent gathering of New South Wales farmers. The average yield per cow for the State was 150 lb. of butter per annum, yet there were some herds which were doubling that yield and many others which were over the 200-lb. mark. This simply went to show the great number of cows that should have no place in the dairy herds, and which were not showing their owners a profit.

Describing the development of the herd-testing movement in his own (the Candelo) district, Mr. Filmer said that in 1921 he and the manager had gone exhaustively into the average production of cows milked to supply the factory. They found this to be about 115 lb.—at most not more than 120 lb.—of butter per cow per annum, and this fact had stirred some of them to form a unit in connection with the factory. After eight or nine years' continuous testing he had been enabled to increase the average yield per cow in his own herd from 180 lb. to just on 250 lb. of butter per annum, and this with a herd ranging from 95 to 100 head. On looking over his last twelve months' test records he found the best cows made 519 lb. of butter, five over 400 lb., thirty-two over 300 lb., sixty-two over 250 lb., and ninety over 200 lb. For the period 1927-28, the best cow made 415 lb., thirty-seven over 300 lb., sixty over 250 lb., and eighty-one over 200 lb.

Herd testing had everything to commend it to the dairy farmer as a good business proposition and it also made the work much more interesting. But many disappointments awaited the beginner. The cow he thought the best in the yard, if not in the district, might be found to be unprofitable, and the one thought hardly worth keeping might be "carrying the favourite on her back."

It was not advisable to sell or cull out on one test. It was advisable to go on for a number of years. He would advise setting a standard and then gradually raising it. They would find that some cows did extra well for two or three months under favourable conditions and then went off; others did not do so well at first, but they were consistent producers to within two or three months of next calving, and when their production was totalled they were much ahead of the big yielder of a month or two. Hence the necessity for testing over a period. In his opinion testing should be continuous—it was unwise to test for a year and then leave off. They were constantly getting fresh milkers in the yard either by purchase or breeding.

The dairyman who had, say, from 80 to 100 cows, and who wanted stock as much as butter, might be able to do without testing, but the man who had, say, forty cows could not afford to keep "boarders." Testing was vital to him—it meant the difference between success and failure. If a farmer had a herd of, say, forty, and each was producing 175 lb. of butter per annum and he raised this to 250 lb. per annum, which was quite possible, it meant an increase of 3,000 lb. of butter, which at 1s. 3d. per lb. amounted to £187 10s., an amount that would more than pay the interest on an overdraft of £2,500 at 7 per cent.

There was another aspect also, for when the farmer knew his cows' production he was not in the dark when selecting his own heifers to carry on with, for the old saying that "like produces like" was true, especially when the farmer was wise in the selection of the sire.

In many cases it had been the practice to get rid of cows at from 8 to 10 years old, their owners contending they were unprofitable, but he could not agree with that. They had in their herd a few cows that were first tested in 1919, and were still profitable, as during the last testing period they had made up to 300 lb. of butter. It was also advisable to get as many heifers as possible from an extra good producer, even to the extent of keeping her longer than usual.

The figures presented by Mr. Filmer showed that the factory's production had steadily increased from 363,516 lb. to 540,214 lb. during the four years 1926-29, despite the fact that there were upwards of 200 cows fewer than in 1926. That increase, he said, had been largely due to the improvement in the herds that had come about through testing.

The Importance of Pedigree.

It is a matter of some surprise (writes a correspondent to the "Livestock Journal," England) that there are still men claiming to be stock-breeders who do not realise the value of pedigree—men to whom it is necessary to explain the meaning of pedigree. A stockman replied to a question of mine the other day that he "would breed a good beast without pedigree." Undoubtedly he could, but he could never succeed ultimately so well without pedigree as he could with it. As a matter of fact, a good sound non-pedigree herd is the best foundation one can have upon which to use a good pedigree bull for the improvement of the commercial stock. Still, one should aim higher than that. It is not possible to raise up a pedigree herd without a pedigree foundation. To improve commercial stock by using a pedigree bull is one thing. The use of the right kind of bull will do all that one can hope for in that direction. Starting a pedigree herd means using pedigree females as well as pedigree males.

The value of pedigree is that it enables one to know more definitely beforehand what to expect in the progeny. With pedigree one knows the kind of animal being bred from, but without it one does not. The family tree might be a long one or a short one, but, providing it has been a successful one, it helps by enabling the breeder to take his aim beforehand. Without entering into a discussion of the technique of breeding, it may be said that the successful pedigree animal is the one that, besides having a good pedigree, carries all the characteristics of the breed in colour, size, conformation, and physical ability. Without these last-named qualities pedigree is not of much use in an animal. On the other hand, pedigree denotes ability to carry these qualities, prepotency to perpetuate all the desirable qualities of the breed.

I mention these points because there has been a good deal said during recent years on the desirability of improving commercial stock by a more extended use of pedigree bulls, and many people have come to regard this as sufficient effort. But it cannot be too clearly emphasised that the mere use of a pedigree bull, though good and valuable in itself, is not pedigree stock-breeding. The point which the intelligent farmer often has to decide is whether he will go on merely improving his commercial herd by this means or whether he will embark upon pedigree breeding. It is then that a consideration of the value of pedigree comes in. What is pedigree in practice and what is its value?

We are all agreed that the use of a pedigree bull will improve a commercial herd. A pedigree herd enables us to contain in that herd those desirable qualities which when used on non-pedigree animals improves their quality. We ourselves breed those qualities we so much want. The value of pedigree consists first of the power which its use puts into our hands for retaining and using all the best qualities of a breed and, secondly, of the means which it provides for enabling us to build up to an ideal in breeding so that we may further improve on the quality of the breed and breed out undesirable points.

There are very few really successful pedigree breeders; and that is why we are obliged to go to someone else to improve our herd and why we are willing to pay the price.

In conclusion, it may be said for the benefit of those contemplating pedigree breeding or of changing their methods, that there is a cash value to pedigree. Pedigree in an animal, no matter when he is disposed of, is of some cash value over and above its ordinary commercial value. To some this may sound a small point, but really it is a very important one, and we shall do well not to lose sight of it, especially in its full application to the value of a herd.

Fecundity of Berkshires.

The statement that "Berkshires do not farrow enough pigs," has been challenged by the Berkshire breeders of America.

Attention has been turned to the statistics as contained in the first 1,400 litters in volume 63 of the "American Berkshire Record." The 1,400 litters showed a total of 12,309 pigs farrowed, or an average of 8.792 pigs to the litter.

Of the 12,309 pigs farrowed in these 1,400 litters, 9,803 of them were reared. This makes an average of 7.002 pigs reared per litter.

A summary of the 1,400 litters shows—

9 litters of 3 pigs each	130 litters of 11 pigs each
19 litters of 4 pigs each	61 litters of 12 pigs each
46 litters of 5 pigs each	42 litters of 13 pigs each
99 litters of 6 pigs each	12 litters of 14 pigs each
177 litters of 7 pigs each	11 litters of 15 pigs each
282 litters of 8 pigs each	2 litters of 16 pigs each
294 litters of 9 pigs each	1 litter of 17 pigs.
215 litters of 10 pigs each	

Pasture Improvement—A Southern Farmer's Experience.

Mr. F. J. Smith, of Bombala, New South Wales, has experienced considerable success in connection with the top-dressing of the natural pastures on his property, as well as with the sowing of introduced grasses and lucerne.

The benefits derived from superphosphate on oats and lucerne convinced him that the use of fertiliser was a payable proposition, and he decided about six years ago to test the value of superphosphate on the most important (from the grazier's point of view) of all crops—grass.

He selected 40 acres of natural pasture which had a carrying capacity of one and a quarter sheep to the acre, and applied the superphosphate in March at the rate of 1 cwt. per acre. The immediate results were not spectacular, but clover and trefoil gradually made an appearance, and greatly added to the quality of the pasture, as well as the bulk of feed available, until to-day Mr. Smith estimates that the carrying capacity is two and a-half sheep to the acre—just double what it was six years ago. Although he found that the wool of sheep on top-dressed pasture coarsened up somewhat, still the increased weight of the fleece more than made up for any loss in that respect. Moreover, there was an added advantage in that the animals depastured on the top-dressed area were far healthier and comparatively free from internal parasites.

The estimated cost of top-dressing was only about 7s. 6d. an acre in this case, and as the benefit of the application is noticeable for about three years, the cost can fairly be reckoned as spread over that time.

Mr. Smith has had even greater success with the sowing of grasses for the improvement of his pastures. On one paddock, of five sheep-to-the-acre country, he sowed Subterranean clover seed at the rate of 4 lb. per acre, along with superphosphate at 1 cwt. per acre. The increase in carrying capacity has been phenomenal. For the past five years the paddock has averaged four sheep to the acre, while at times it has carried up to nine sheep to the acre. At a cost of 2s. per lb. for the clover seed and 7s. 6d. per cwt. for superphosphate, Mr. Smith, naturally, is convinced that the expense has been well worth while.

On another area he sowed a mixed pasture of Wimmera Rye grass, Cocksfoot, Giant Fescue, Subterranean clover, and lucerne. The ordinary manure spreader was used for sowing the seed, with which had been mixed superphosphate at the rate of 75 lb. per acre. While this land was previously only capable of carrying $1\frac{1}{4}$ sheep to the acre, it has since carried as many as eight sheep per acre for as long as eight months of the year, and during that time six tons of grass hay had been cut and stacked.

The wisdom of sowing lucerne in a permanent pasture has also been amply demonstrated on this Bombala property, although Mr. Smith confesses that his first efforts to establish lucerne were somewhat unsatisfactory until he decided to top-dress with superphosphate. The success is just another link in the chain of evidence in support of the claim that practically the only place where lucerne will not grow is where it has not been sown.

In the face of such convincing evidence it is very difficult to understand why it is that top-dressing and pasture improvements work generally are not more widely practised. The expense is not great, the returns are considerable, and by making an acre support two sheep (or more) which previously only carried one, such improvement suggests itself as a ready means of cheapening production.

Why Not Hard Work?

"During the war it was shown what an enormous productive activity a people is capable of developing compared with ordinary times," writes "Scrutator" in the "Scottish Bankers' Magazine." "Everyone then vied with his neighbour to help to make two blades of grass grow where one grew before. Since the end of the war the process has been practically entirely reversed.

"Nearly everyone has vied with his neighbour in indulging in an orgy of extravagance and waste. The figures already given surely demonstrate that beyond question. Practically everyone to a greater or lesser extent in every class of the community is involved in responsibility, and it is useless for anyone to try 'to compound for sins they are inclined to do by damning those they have no mind to.' The economic war with unemployment can be won in no other way than the war was won.

"Let us reverse our spendthrift habits and throw all our resources of money and physical power into the reproductive and fructifying channels of productive industry, thus increasing and cheapening the necessaries of life, creating demand for them, and turning the vicious circle of the dole and extravagance and waste into the healthy channel of supply and demand of the necessaries of life. Is it a counsel of perfection? It will need all the determination and self-denial by every class shown in the war, but it will be no less successful than it was in war-time."

No Room for Bad Cattle.

What one notices at sales everywhere is that cattle of good quality always sell at a profit. It is the second-class qualities that are the drag on the market, not only failing to make a profit themselves, but depressing trade for the best stuff. One is amazed at the number of cattle of second and even third class quality to be found on the markets. But they are known and the trade for them is bad.

Why do breeders not eliminate this class of stock altogether? This stock not only keeps down the average prices for all qualities, but is a danger in itself. Some of the cattle get passed off, and although a grazier is usually a good judge it is no unusual thing for him to be saddled with inferior animals. Now, it should be remembered that the grazier does not often have much of a good time, and to find his purchases including a few wretched scrubs means that a fine hole is eaten into his profits. This year the grazier is having to pay dearly for his stock. We hope that prices all round will be maintained at a sufficiently high level over a sufficiently long time for him to make his profits.

The grazier and the feeder, much more than the rearer, know their markets. They know the class of stock they must put on the market to sell. Therefore they know what they want to buy. The rearer should be able to supply their needs, and would be able to do so if he would take a little more trouble in buying stock of quality to rear, or in breeding it, as the case may be.

Most of the bad cattle stock in the country is a result of bad breeding. This breeding could be improved, and quickly so, by banning the use of the scrub bull. Many farmers are still under a delusion as to the value of pedigree in the sire, for they think that a beast is a beast, and that if he has good grazing and good feeding he will be all right. But he never will. No amount of care in feeding or other management ever made a badly-bred beast into a good one. There is only one remedy. Keep off the bad bull, and do not buy calves or young stock because they are cheap unless the breeding is good as well. At the moment, with better qualities so dear, there is a temptation to fall back on poor quality because it costs less money. Let those who do this remember that when the market begins to fall the worst stock goes first, and that if money has to be lost over cattle it is the cheap ones—the poor quality ones—that lose most.

There is still much hesitancy, and even silly talk, among farmers on the scrub bull question, but he will have to go, and the sooner all stockmen reconcile themselves to this fact and prepare to conform to reasonable regulations in the matter the better it will be for the stability of British trade. We see the benefits of well-bred cattle, no matter what state the trade is in. Good-bred cattle pay when trade is moderate, when it is bad they keep things together better than poor ones, and in good times they really pay their owners.

In general terms the same remarks apply to sheep, but these, of course, are very dear, and the difficulty in regard to breeding is not quite so great as with cattle. Sheep breeders are a class to themselves, and manage to turn out good stuff. Farmers who are not sheep specialists also seem to recognise the value of a good tup, or a good stallion among horses, more than they do a good bull. Why this should be so is difficult to say, but it seems to be a fact. Still, even with sheep it is quality that

tells. And to-day when sheep are really difficult to buy, we find people who think they will try their hand at the job, starting with just the wrong kind of stock, because this happens to be a little cheaper in each outlay than the best.

Among cattle and sheep the tale is the same. Breed the best and you are sure of a market. Pigs, too, come into the same category, though the position is rather different owing to the liability to rapid soarings and slumps in the trade. But even here quality will out. Especially if it is of the sizable bacon and not too fat kind which the provision merchants can sell so well, and which the curers like to supply. At this time, when stock prices are high, it is well to be on guard against the temptation to indulge in cheap stock, whether cattle, sheep, or pigs.—L. M. Marshall, in the "Live Stock Journal" (England).

Founding a Herd.

Laying the foundation of a herd is a matter to which considerable thought and trouble should be devoted. To the real progressive breeder there is always a goal not yet reached, a perfection not quite attained, more and more desirable characteristics to be bred into the cattle, the expectancy of a mating to be fulfilled, a business that becomes more intensely interesting.

A beginning must be made before there can be any progress. Some will say to buy only the best and mate with the best, but if this were the only way Shorthorn herds would not be as popular as they are. Experience is one of the most necessary requirements and, like learning to swim, the way to learn is to get in. Like many other trades, there is much to learn, and the more one does the more experience and, consequently, the more knowledge. Comparison is a great help, and among several head one is soon finding there are some that have not fulfilled his expectations, and we wonder why, and try to find out if we are real breeders.

We ask some older breeder or herdsman all about the ancestry of our cow and her good points and faults. Then we either conclude that she is not worth bothering about as a breeding proposition or that she needs mating with a more typy and more thickly-fleshed bull. As a better bull will help on all the cows, a bull that nearer meets our new ideal is purchased. The cow is also sold, and with her faults in mind, a better one is purchased. In the new crop of calves we note the improvement, and are pleased.

Now, about this time we find that a neighbour breeder has a cow or two with qualities that we had not been able to see before, and that still another breeder has his cattle in much better flesh than ours. Now, we have known that he takes good care of his cattle and feeds them well, but we were doing all we knew how to do for our own. On asking a friendly breeder who has been successful, we are told that we should have a good feeder or herdsman. Following his advice, a herdsman is added, and if he is one old in experience we soon find out how little we knew, and also have defects pointed out to us we had never seen and knew but little about.

As we go over the breeding of the cows with this man and he tells us of the good and bad things in their ancestry back several generations, and which are cropping out in our calf crop it is then we begin to realise what is meant by a good herd bull, and also how bad we have been needing this herdsman with his wide experience. In fact, the herd-building job begins to look too large for us, and we are half discouraged. But on looking over the situation we find that we are well in advance of many breeders, and doing as well as others and better than many, so we decide to stick and to add a few better breeding cows that more nearly approach our new ideal. We will watch the successful breeders more closely, and watch our chance to put in a breeding bull that is a credit to any herd.

This in time is all done, and we find that we are producing cattle that compare favourably with the good breeders of the country, and it is only a few years since we bought our start. We have grown to like our cattle, and to know them intimately as individuals, as the good or bad of their ancestry is tucked away somewhere in our mind. We figure a year ahead just the proper mating for a certain cow, and speculate on the coming calf, and wonder if any of the defects of its grandparents will be apparent, and rather hope the strong points of the new bull will overcome them.

We have met many strong-minded men who are the foremost men of the nation in their business. We have competed with them, and it has brought out all the generalship there was in us. We have broadened our minds. We have travelled and are acquainted with our own country. We are identified with the people that do things. It is an advantage to our children. We feel that we are on the right road, and that in time we will produce cattle that will be a benefit to future generations. What an interesting and profitable art is herd building, and we begin to realise there is no limit to its success—"The Livestock Journal" (England).

An Irish Litter Record.

In a recent issue of the "Weekly Irish Times" reference is made to the prolificacy of Irish breeding sows. One of these sows, owned by Mr. P. Kennedy, Mountloftus, Goresbridge, had a litter recently of twenty-one strong, healthy pigs. This was considered to be a record in County Kilkenny.

The Real Function of Licks.

The real function of licks, writes the Chief Veterinary Surgeon of the New South Wales Department of Agriculture, lies in providing mineral matter which is lacking in the soil. Frequent attempts have been made to advocate their use on purely medicinal grounds, but most of the claims so made will barely stand inspection. There appears to be no evidence, for instance, that they can be utilised in the prevention of any specific disease, though doubtless where they are used to balance a mineral deficiency they will increase the general power of resisting disease. At times various ingredients which are of no value as food and do not supply any mineral deficiency are included. As examples may be quoted gentian, aniseed, and foemyree. These are all mild stomach stimulants and carminatives, but the average sheep has a perfectly good appetite which seldom requires stimulating. As agents in the treatment of sick animals they have their place, but not as regular feeding materials to perfectly normal stock.

Denmark's Agricultural Advance.

How Denmark has advanced in the world of agriculture during the last fifty years was pointed out by the President (Mr. Henry Smalley) at the luncheon at Blackburn, Mellor and District Show (England) recently. It had not been done by lower wages, he said, for in Copenhagen wages were from 5 to 10 per cent. higher than in London. Before 1880 Denmark was poor, and had an ignorant agricultural population with very inferior cattle and an apparently small export of dairy produce. In 1928 they exported £66,000,000 worth of agricultural produce, which was £19 per head of her population. Since 1880 she had increased her export of butter nine times, bacon thirty-five times, and eggs thirteen times, and now she exported one-third of the whole of the butter exported in the world, one-quarter of the bacon, and one-tenth of the eggs. How had it been done? By greatly improved education and intensive cultivation. The productivity of the land in Denmark had been increased by 75 to 90 per cent. in the fifty years, and there was a smallholder cultivating ownership of 90 per cent. of the land.

"Music Soothes ——." Broadcasting for Cows.

Mr. A. H. McLean, a farmer of Hauraki Plains, Auckland, New Zealand, claims that there is a marked increase in the production of milk from his cows as the result of providing his herd with wireless music. In proof of his assertion, he can show a drop in factory weights for every Tuesday morning, corresponding to the Auckland broadcasting station's silent day on Monday. Mr. McLean also states that his cows stand quietly as long as the music is coming over, and that they come in to be milked of their own accord when they hear the music commence. It has long been known that cows are fond of music, and some American farmers provide it for them.

It is frequently claimed that milkers who sing at their work get better results than others, but that is usually attributed to the fact that milkers who sing must be in a good humour, and thus treat the cows gently.

Marketing Citrus Fruit—Californian Methods.

Interesting reference to Californian methods of preparing citrus fruit for market is made by Mr. J. W. Blick, of the Producers' Co-operative Distributing Company, Limited, Sydney, in a recent report on the prospects for the marketing of Australian fruits overseas.

The care with which the fruit is handled in the packing sheds with a view to obviating the possibility of the skin being in any way bruised is most striking, it is stated. The same care is exercised in the picking, handling, and transfer of the fruit from the trees to the shed. Before being graded and sized, lemons are washed and brushed for ten minutes in soft soap and water at a temperature of 115 deg. Fahr., and then immersed for five minutes in a bath of bluestone and water at a temperature of 110 deg. Oranges are treated by being first put over the brushes, and then for twelve minutes travelled through a bath of warm water impregnated with a cleanser, the temperature of the solution being 110 deg. Fahr. They are then sprayed with cold water and subsequently dried as they travel over

rollers on their way to the grading tables. By a simple contrivance the word "Sunkist" is stamped on each orange or lemon entering the grader. Although this process is a simple one and involves no extra work on the part of any of the staff and but a small outlay for the appliance, it has done a wonderful lot to popularise the "Sunkist" pack in all parts of the world, for the fruit retains its identity through all trading transactions right into the hands of the consumer.

Coloured wraps are universally used; they improve the appearance of the fruit in the cases, while the attractive labels stand out boldy on the ends of the cases.

Mr. Blick is of the opinion that Canada is a potential market for our citrus fruit (Valencia late oranges, arriving in October or November), and substantial extension should also be possible in the East. To develop trade in those parts of the world, however, it is necessary that Californian methods and packages, including the continuous supply of large quantities of fruit under a common brand, be adopted. These methods in packing and marketing oranges have practically set a standard all over the world, and Australian progress will be simpler and extension more rapid if they are adopted than if we set up standards of our own and have to convince oversea traders that these, together with our fruit, are of equal if not better value than their purchases from U.S.A.

Improving the Dairy Herd.

The bull is a potent factor in the improvement of the herd, but it is not enough that he should be pure-bred and that he should show the points of his breed—he should be of a productive family too. It is sometimes contended that his selection according to his capacity to endow his daughters with the power of high milk production is the only reliable method, but this involves keeping the bull for several years instead of for two or three, which few farmers can do, as it means in practice keeping more than one bull on the farm. An effort should be made, however, to trade bulls in such a way that their whereabouts may be known, for while many bulls are well got rid of, others would be worth a good deal to get back. Whatever its breed, the bull should be of a vigorous, masculine type, capable of transmitting his characteristics to his offspring. Constitution should be indicated by a capacious chest, much width through the region of the heart, a bright, full eye, round barrel, and well-sprung ribs. The skin should be soft and pliable, the neck should carry a good deal of crest, and there should be nothing coarse or flat over the shoulders. The carriage should be active and the manner alert, though the temper must be equable. The placing of the teats in a calf generally follows closely that of the rudimentary teats in the bull, hence a sire should not be purchased in which they are not properly placed. If they are bunched together the animal is certainly not a desirable one. Lack of constitution is indicated by a dull, sunken eye, a long, thin neck, flat ribs, long legs, cramped lung and heart space, harsh skin, and staring coat.

Similarly, quite apart from the qualities of her breed, the cow to be bred from should show femininity and constitution. A distinctly feminine appearance is an indication of activity of the sexual organs. Constitution is denoted by a broad chest, giving ample lung capacity, and a large girth, affording plenty of room for the heart. The barrel should be both deep and long, as there is then plenty of room for the digestion of large quantities of feed. The eye, again, must be full and prominent, the carriage active, the skin loose and soft, the horns and hoofs fine. In form a dairy cow should be wedge-shaped, light in front and heavier behind, and the pelvis broad. The best milkers have invariably a well-shaped udder, and large and tortuous milk veins that extend all over the udder and away from it. Good milkers are generally spare in flesh. Cows that do not produce, say, 160 lb. of butter-fat in a lactation period of 273 days should not be mated, but should be dried off, fattened, and sold. None of the foregoing points must be regarded individually as infallible signs of heavy production—what must be looked for is a combination of them all.

Judgment is necessary in mating sire and dam. In some measure the deficiencies of one may be rectified by the qualities of the other, but this is only true in a measure and only of certain characters. There is no assurance, for instance, that lack of constitution in one animal is likely to be compensated for by the other. The defective animal should be rejected altogether if there is not to be a risk of the progeny proving a "scrub."

Temperamental differences must be taken into account; two highly nervous animals are not likely to be mated to advantage. Relationships must also be watched; if blood connection exists it may be inadvisable to mate the animals.

Feeding is also an important factor in mating cattle. Insufficient and too ample feeding of the animals to be mated must both be avoided.

The Home and the Garden.

OUR BABIES.

Under this heading a series of short articles by the Medical and Nursing Staffs of the Queensland Baby Clinics, dealing with the welfare and care of babies, has been planned in the hope of maintaining their health, increasing their happiness, and decreasing the number of avoidable cases of infant mortality.

LEAD POISONING.

Just step on to your veranda and rub your hands hard on the veranda rails. If a powdery substance sticks on your hands, make sure that the paint is non-poisonous. For if not, your house is a death-trap for children.

Lead paint is known to be poisonous all over the world. But lead-poisoning on a considerable scale affecting children only has been reported only from Queensland. Why should this be? The answer is not difficult. For good reasons most of us live in houses built of wood. For convenience in building and for protection against white-ants houses are built on high stumps. The verandas, which are so necessary in this climate, must therefore be protected by rails, and to look well these rails must be painted. Wooden surfaces coated with lead-paint are harmless so long as the paint adheres firmly. They are dangerous (1) while the paint is still moist and sticky, (2) when the paint is loose and powdery. Paint on surfaces outside the house exposed to the weather usually becomes powdery within two or three years. Anyone who has observed little children clinging to the rails of a veranda, and who knows how often their fingers go into their mouths, will understand easily how they get poisoned. It is not only from veranda railings that they get poisoned; painted gates and fences are equally dangerous. Older children sometimes get poisoned in the same way. On inquiry it will usually be found that they have the habit of biting their nails.

Signs and Symtoms.

This is a slow form of poisoning. Lead gradually accumulates in the body, and it may be some time before the child gets ill. Usually the first sign is griping or colic, often called stomach-ache. Of course, colic may be caused by over-eating or indigestible food. But lead-colic has no relationship to food. It may persist at intervals, especially during the night for several days or a week although the child is eating scarcely anything, and perhaps vomiting most of what he does eat. Then rather suddenly the pain stops, and the child eats anything and everything until his next attack, which probably occurs within a few weeks, and is perhaps accompanied by pain also in his legs. If the disease progresses, the next thing noticed is a weakness in the legs. The child walks badly, his legs may give way suddenly, his toes drop so that the foot has to be raised high, and even then his toes barely clear the ground, so that he trips easily. Both legs are equally affected, and you should now know that your child has got chronic lead-poisoning fully established. It will take three months or more for him to recover if he is removed from the source of the poison. If he is not removed, he may be a cripple for life. If he recovers and returns to the poison he will have a second attack, and this will be worse than the first.

Other and more Dangerous Forms.

But lead-poisoning takes other forms sometimes, more acute and still more dangerous. At the very beginning or at any time during the illness the child may have an attack of convulsions. Now convulsions may be due to many causes, the most common being over-eating of fruits, cakes, or sweets; another common cause is high fever coming on suddenly. But convulsions from lead-poisoning are unusually severe and not infrequently fatal. If the convulsions occur easily in lead-poisoning it is very probable that their cause will never be suspected.

The Sad Effect.

The most sad effect of lead-poisoning in children is complete and incurable blindness due to destruction of the optic nerve. These cases are not so common—they usually have had no previous signs of lead-poisoning or none that have been noticed—and consequently they may not be recognised until too late. If recognised, early blindness can always be prevented; after it has been established, no treatment will restore sight. Fortunately there is one symptom that is nearly always present at the beginning of the attack, and that is the development of a squint. This has nothing to do with the common cause of squint, which may be cured by wearing glasses. If your child has a headache and develops at the same time a squint, which he did not have before, get medical advice immediately. He may be suffering from the form of lead-poisoning that attacks the eyes, and prompt treatment may save his sight.

Unfortunately lead-poisoning has remote consequences that are extremely grave by its action on the kidneys. Kidney disease has many causes, and among them is lead-poisoning in childhood. These children may have recovered from their early symptoms but their kidneys may be left defective. Not exactly ill, but never really strong, they survive only to die in their teens or early twenties, usually rather suddenly and unexpectedly.

A Good Law Plus Enlightened Public Opinion.

There is a law in Queensland forbidding the use of lead paint on outside surfaces within the reach of children's hands. Whether this law is effective depends on the existence of public opinion in favour of strict enforcement. Surely we should protect our children.

THE FARM HOME.

PURITY OF FOODSTUFFS—SOME SIMPLE TESTS.

Thanks to the efforts of the authorities that are responsible for the purity of our foodstuffs, the adulteration of commodities is not so common as in the past, says the "Journal of Food Industry," London. Unfortunately, however, impure foods are still on the market. The following tests will enable buyers to determine if the foods they are receiving are pure or otherwise.

The expert coffee taster can tell by simply tasting the beverage if chicory has been added, but to the ordinary consumer this would not mean much. An infallible test is to place a teaspoonfull of the dry coffee in a tumblerful of cold water, stir well with a spoon, and leave for a minute or so. If the water remains clear the coffee is pure, but if it takes on a brownish tint chicory has been added. The darker the brown tint the greater the amount of chicory that has been added.

To test the quality of sugar, burn a sample in an aluminium spoon over a gas jet. If the sugar burns away entirely it is pure, but if any ash remains adulterations have been added.

The best way to test olive oil is to pour a quantity into a small bottle, add an eighth of the quantity of household ammonia, and shake well. If the mixture assumes a milky mass the oil is pure, but if it has a granulated appearance other oils have been added.

The simplest test for butter is to place a little in a spoon and hold it over a gas jet. If the butter boils evenly it is pure, but if it splutters and a scum appears margarine has been added.

To test flour, press a sample in the hand; if, when the hand is opened, the flour retains the impression of it and appears slightly yellow it is pure, but if it falls into powder and retains is usual colour adulterations have been added.

A good way to ascertain if milk has been "creamed" is to skim it after it has stood for an hour or so. If after the skimming a slightly bluish tinge appears round the edges, the milk is all right, but if the edges appear as before, the milk has been "creamed." To test if water has been added to the milk dip the point of a well-polished needle into it, and withdraw, holding the needle perpendicular, with the point downwards. If the milk adheres to the point it is pure, but if all of it drops off water has been added.

FARM HOMES.

MAKING THEM BEAUTIFUL

Beautiful home grounds are the first essential to a beautiful State. No matter how attractive the grounds around public buildings, or how well cared for the borders of our highways, or how numerous and fine the natural beauties of the State, if our home grounds are slovenly and unattractive, then we cannot boast of a beautiful State.

Our slogan should be, "All home grounds, attractive home grounds." Do I hear someone say, "Impossible or impractical." Not so! It is only impossible or impractical when there is no desire for attractive surroundings or lack of initiative or ingenuity in making them attractive. Too expensive! No, not necessarily, for a little labour and the seeds of a few annual flowers to be had for a few pence can often change a repulsive yard into a place which will attract attention and elicit favourable comment. Let us no longer look for lame excuses as a reason for not doing something which we know needs doing and which richly rewards him who brings about the transformation and gives pleasure to his neighbour and to the passers-by.

Fencing and Planting.

An attractive home ground must have the appearance of being well cared for. Nothing detracts more from a place than to have the yard littered with objects which do not belong there. This applies to the grounds in the rear of the house as well as to those in front. If it becomes necessary to store machinery or carry on certain operations between the house and barn, divide the space into two distinct areas and by proper fencing and planting hide the features which would detract from the beauty of home grounds. Twenty-five years ago one would scarcely see in a day's travel a farm home ground which was mowed with a lawn mower. But the farmer appreciates neat appearances as much as his city cousin, and as a result the lawn mower is rapidly becoming standard equipment on the farm. A hay field is attractive, but not when it surrounds the farm home. Mowing of the lawn is necessary, and the lawn mower is the best implement for that purpose. While other methods may be used for keeping the grass under control none of them produce as good a lawn or as satisfactory an appearance as the lawn mower.

Part of the Picture.

Make the house appear as a part of the picture you are painting with grass, shrubs, flowers, and buildings. To do this you must give the house a setting. Trees are valuable for this purpose. Tall trees at the rear of the house and at the sides at some little distance from the house are very desirable. They may not look like much soon after planting, but in years to come they will form a background and frame for the house which will enhance its attractiveness manifold. Trees may also be used along the highway, and if the lawn is fairly large, as individual specimens on the lawn, or if very large, possibly in small clumps. Stick largely to the native trees, particularly the more permanent kinds, and never plant them in rows except along the drive.—J. J. Moore, in "Hoard's Dairyman."

WOMEN AND THE PURSE.

Accustomed as we are to the phrases "economics" and "standard of living" nowadays, we are apt to disregard their real meaning. Miss Janet Mitchell (Thrift Service Director of the Government Savings Bank of New South Wales), at a New South Wales Agricultural Bureau Conference recently, pointed out that while we have concentrated on raising the monetary standard, we have devoted very little attention to the right type of education, which alone can make the individual really profit from increased wages and increased earning powers. Particularly have we been behindhand (said Miss Mitchell) in our appreciation of the importance of training woman for her vocation of home-making. The present economic condition of the country is to a certain extent the responsibility of each one of us, in so far as we have not been spending thriftily and intelligently. "I will take one factor which has contributed to a certain degree to our present economic ills," added Miss Mitchell, "the enormous growth of time-payment since the war, particularly of time-payment as applied to luxury purchases and to articles for immediate consumption, such as clothing. Now, who is responsible for the bulk of such time-payment purchases? The person responsible for the hold this particular type of trading has got on our community is the woman—the wife of the average wage-earner. Yet, can we

altogether blame her, with her lack of training in practical economics, for falling a victim to the lures of 'go-getter' salesmen? Can you expect a woman, who has never studied the question of time-payment in its relation to production and distribution costs, who knows nothing about the heavy overhead expenses of running a time-payment business, to realise that the purchase she makes, say, of £5 worth of clothing by cash order is just one drop more added to the cost of living, and that she, the wife of the man on the small or moderate income, is always the first to suffer by any increase in the cost of living? Or take, for instance, the case of a girl who has passed through high school (although her talents and her capabilities quite obviously do not fit her for a business or professional career) because her parents consider it sets a hallmark of social standing. Can you expect this girl, who has had practically no training in domestic arts, to make the first and most critical years of her married life run smoothly, with the comfort of a well-kept and well-organised home?

"The Domestic Science courses are doing excellent work for some of our girls; but just think what a small proportion of our girl population they are touching!—only a few thousands every year. In Europe and in the United States training in the financial side of home-management is a compulsory part of every girl's education, just as compulsory as the learning of reading and writing.

"At the present time, unfortunately, we have not trained ourselves to think sufficiently highly of the domestic arts—an attitude that is reflected by the whole status of domestic service, and, more seriously, in the unwillingness of numbers of parents to allow their girls to enter on a domestic science training. As one head mistress said to me recently, when she was deploring the relatively few entries there were for the domestic science section of super-primary schools: 'We cannot hope for better things while the parents look upon it as a slur on their child's mentality when you try to persuade them to let the girls take the domestic science course in preference to the commercial or the high school course!' Why should it be a slur on anyone's mentality to wish to learn efficiently the fundamentally important and extremely interesting household arts? Even for the girl who is pre-eminently fitted for a business or professional career, instruction in the intelligent ordering of her household is a necessity. The more skilled we are in any task, the more quickly will it be performed—the more time, therefore, will there be for those things which we consider most worth while.

"Here is a point on which I think we are being forced to revalue our standards. The fact that perhaps for many years we, none of us, will have so much money to spend on outside amusements will force us to lay more emphasis on the importance of simple recreation at home, will force us, therefore, alongside of this, to take more earnest stock of our homes, of our methods of home-making; it will force us to consider more seriously the enormous social value of the woman in the home who does well what is specifically a woman's work, with a sense of pride and dignity in its achievement.

"Country people especially (said Miss Mitchell in conclusion) had a tremendous opportunity to build up the very finest type of home-life, to make the home a centre of interest and recreation, not merely a place where meals were scraped together. The educational work of the Agricultural Bureau was helping people to think more seriously of the importance of building up the right kind of home environment. The only sane standards we could follow were those of living and spending in a manner without menace to our own or our children's future."

CONTROL OF WEEDS ON LAWNS.

Weeds in lawns and on bowling and golf greens cause considerable annoyance and trouble, and are often difficult to control, especially if proper precautions have not been taken from the outset. As a rule, most trouble is experienced on lawns and greens which have not been properly drained, or which are shaded, or where the soil has not been enriched before laying down the grasses. It is obvious, therefore, that control of weeds in such places must be kept in view from the time that the lawns are being established.

In the case of bowling greens and golf greens special care should be exercised to see that they receive direct sunlight throughout the whole of the day, particularly during the winter months, and also that they are thoroughly drained by means of agricultural drain pipes placed below the ground. The soil should also be enriched either by adding a better class of soil or by heavy dressings of well-rotted animal

manure. If these precautions are adopted and high-grade seed, free from weed seed, is sown thickly, little trouble will be experienced from weeds. Subsequently, a vigorous growth of the grass should be encouraged by frequent watering and by top-dressing with well-rotted animal manure composted with soil.

When such dressings are being made, care should be exercised to see that all weed seeds have been destroyed in the compost. This can only be done by compositing the soil and manure in heaps which can be kept under observation for some months. If it is not possible to ensure that the composts are free from weed seeds, it is preferable to use artificial fertilisers for top-dressing.

Despite the greatest care that is taken, however, weeds will occasionally appear in lawns, and they must be immediately hand-pulled. If care is exercised in this direction, no great difficulty will be experienced in keeping the weeds under control. Clover is often troublesome in lawns, and this can be checked to some extent by top-dressing with sulphate of ammonia, which does not encourage the growth of clover, but stimulates the growth of grass, which checks the clover.

Superphosphate and lime should not be used on lawns which are likely to be infested with clover, as they stimulate the growth of clover.

Chemical exterminators cannot be recommended to any extent for control of weeds on lawns, but they can be used, particularly arsenic preparations, for killing individual plants such as paspalum grass. A little of the preparation should be dropped on the middle of the plant.

BOUGAINVILLEA.

Visitors to the beautiful garden of Mr. Thomas, at Indooroopilly, this year were impressed with the many possibilities of design and effect that can be made with this very hardy and showy climber. The appreciation of the bougainvillea is shown by the hundreds of persons who go to see it in bloom. It is a hardy plant, and loves sunshine, and there is no reason why it should not be more widely grown. A little time and patience will amply repay anyone who contemplates its culture. Cuttings strike readily as soon as the blooming period is over. They should be about 12 inches long. Select last season's growth, and plant in sandy soil in a shady place.

Put the cuttings about 6 inches daay in the soil, and press down firmly. Keep the ground moist, not soaking wet. If you require a more immediate result, obtain plants from the florists in pots. There are about seven different colours to select from. When the plants have grown to a height of 2 feet then select your design and prune accordingly. To train the plant make a skeleton design of wire, and then trim the plant by removing all shoots that may be growing in a direction that is not required. About May or June pruning must be stopped, as all the new shoots then appearing will be flowering shoots. As soon as the blooming period is over commence pruning again to still improve your design.

There are many methods of growing bougainvillea, and one that finds favour with many is that of planting it around an old tree that is not wanted, and ringbarking the tree when the bougainvillea is firmly established. It will then hang down from the branches of the tree and form a beautiful garland of bloom. It is an evergreen and never appears unsightly.

Readers are reminded that a cross in the prescribed square on the first page of this "Journal" is an indication that their Subscription—one shilling—for the current year is now due. The "Journal" is free to farmers and the shilling is merely to cover the cost of postage for twelve months. If your copy is marked with a cross please renew your registration now. Fill in the order form on another page of this issue and mail it immediately, with postage stamps or postal note for one shilling, to the Under Secretary, Department of Agriculture and Stock, Brisbane.

Farm Notes for November.

FIELD.—Farmers are commencing to realise that quick-maturing wheats which possess a degree of rust resistance are more dependable than the slow-growing and often rust-susceptible kinds, which are gradually giving place to these and mid-season varieties.

Growers are advised to make every preparation to work up the surface of the ground immediately after the removal of their crops, so that the soil may be put into good condition to receive any rain which falls, the conservation of which is the best guarantee for the success of the next succeeding crop. Such initial preparation also encourages the early growth of all foreign and weed seeds, and permits of their eradication by the implements used to produce the desired soil mulch. In such manner paddocks are kept clean and the purity of crops is maintained. The careful preparation of areas intended for maize-planting cannot be too strongly impressed upon growers. Deep and thorough ploughing, followed by cross-ploughing and subsequent cultivation of the soil, must precede sowing if success would be attained; and all efforts must be concentrated to obtain a good surface mulch. Failure to follow up the subsequent sowings by harrowing prior to the appearance of the young plant conduces to weed growths and very often entails, by neglect of this operation, subsequent hand-hoeing between the plants in the drills. Harrowing should be discontinued before the plant breaks through the surface, otherwise damage will accrue to the tender shoots of the young plants. When the young maize plant has hardened up it may, with advantage, be lightly harrowed in the direction of the drills, but such practice must discontinue once the plant has attained a height of 6 inches. Close cultivation by inter-row cultivation implements is necessary after every shower to conserve moisture and to prevent weed growth, care being taken to ensure each cultivation being shallower than the preceding one, and so prevent damage to the root system of the plant, which is extensive. Inter-row cultivation should cease with the advent of the cob on the plant; and, if proper attention has been given to the crop, it should, at this period, be unnecessary. Where crops are planted on the check-row principle, inter-row cultivation is facilitated, and more even crops result.

The French millets (red and white), owing to their rapid maturing qualities, form excellent intermediate or supplementary crops, and are suitable for present sowing. Their value for fodder and seed purposes is worthy of more general recognition at the hands of the average farmer.

Past dry periods have impressed upon us the necessity of providing during good seasons against the return of less favourable ones, and in this connection the cultivation of quick-growing fodder plants appeals to us. Many varieties of useful classes of fodder can be cultivated over a large portion of this State; chief of which, perhaps, are the sorghum family for grain and fodder purposes. Of the latter, Sudan grass has much to commend it, and is fast becoming one of the most favoured by stockowners. Grain sorghums, of which Feterita, Red Kaffir, and the various Milos are examples, should occupy a more prominent position for purposes of horse and pig feeding, and are particularly suited to those localities which are unsuitable for maize production. Some varieties of sorghums have strong frost-resisting qualities, and lend themselves to those localities where provision for some form of succulent fodder is necessary during the winter months.

Orchard Notes for November.

THE COASTAL DISTRICTS.

November is somewhat of a slack month for fruit in the coastal districts, as the citrus crop, excepting a few Valencia Late oranges, off-season lemons, and a few limes, is over. Pineapples are also scarce, as the late spring crop is finished, and there are only comparatively few off-season fruits ripening. The main summer crop of fruit in the principal producing districts is only in the flowering stage, though that in the more tropical parts is ready for marketing. It is also a slack month for bananas, as the summer fruit is not yet fully developed, and the bunches that make

their appearance are usually poor. They have been slow in developing on account of the comparatively cool weather of winter and early spring, when the suckers were more or less at a standstill. Young suckers should, however, be making vigorous growth now, and the plantation will require constant attention to prevent the stools being overcrowded with too many suckers. Keep the land well worked and free from weeds of all kinds, as good growth now means good bunches in the autumn and early winter. Where there is a danger of the soil washing badly with heavy rain, rows of Mauritius, velvet, or other suitable beans should be planted at right angles to the fall of the land, as the growth they make will tend to hold the soil, and thus save any from being washed away. When planting beans of any kind, either to prevent washing or for green manuring, don't forget to manure them, as thereby you will get a much greater yield, and as none of the manure is removed from the soil, as the crop is allowed to lie and rot on the ground, it is all made use of eventually by the permanent crop.

A good all-round manure for a bean crop is a mixture of 1 cwt. of sulphate of potash and 4 cwt. of basic superphosphate or finely ground phosphatic rock to the acre, and, if the soil is deficient in lime, a dressing of not less than half a ton to the acre will be found very beneficial, as all leguminous plants require lime to yield their maximum return both of haulm and pulse. The pineapple plantations require to be kept in a state of thorough tilth, and no weeds must on any account be allowed to grow. If blady grass makes its appearance it must be stamped out, as once it gets established in the rows it is only a short time before it takes control, and the plantation is ruined, so that it can only be brought back into profit by taking out the pines, killing the blady grass, and, after thoroughly and deeply working the land, manuring it and replanting.

The planting of pineapples and bananas can be continued throughout the month, taking care to see that the land is properly prepared and that the advice given in previous monthly notes is followed. Young papaw plants that have been raised in the seed bed can be set out now, as also can young passion fruit. Citrus orchards require to be well looked after; the ground must be kept in a state of thorough tilth, and if the trees show the slightest sign of distress, owing to lack of moisture in the soil, they must be given a thorough irrigation if water is available for this purpose. The trees should be carefully examined from time to time so as to note when young scale insects of any kind are hatching out, and when this is noted they should be sprayed with a weak emulsion of a miscible oil consisting of one part of oil in forty parts of emulsion, as this is quite strong enough to kill any young scales before they develop their protective covering. As stated in these notes previously, no oil sprays should be used when the trees are suffering from lack of moisture, as they are then likely to do more damage than good to citrus trees. If scale insects are very bad, and it is important that the trees are sprayed, a weak lime-sulphur spray, or even a soap and tobacco or weak resin wash, will kill the young scales as they hatch out. In the earlier districts a keen lookout must be kept for the first appearance of the mites, which are the direct cause of the darkening of the skin of the fruit known as "Maori." The first indication of the trouble is that when the sun is shining on the young fruit it appears to be covered with a grey dust, and if the fruit is examined with a good lens, it will be seen to be covered with large numbers of small yellowish slug-like insects which are living on the skin. Spraying with sodium or potassium sulphide washes, as recommended by the Department, or with a weak solution of lime-sulphur, will destroy these insects and prevent the fruit from turning black. Borers of all kinds should be looked for and destroyed wherever found. Water sprouts, if not already removed, should be cut away. Vines will require careful attention, and the vineyard should be kept in a state of thorough cultivation. Spraying for downy mildew and black spot should be continued, if necessary, as well as sulphuring to prevent oidium.

Fruit fly must be systematically fought whenever seen, and special care must be taken to gather and destroy any early ripening peaches or other fruit that may be infested. If this is done systematically by all growers, as provided by the Diseases in Plants Act, there will be many less flies to attack the later crops of mangoes and other fruits.

Leaf-eating insects of all kinds should be systematically fought wherever seen, by spraying with arsenate of lead, and potatoes and tomatoes should be sprayed with a combined spray consisting of Bordeaux or Burgundy mixture and arsenate of lead, so that diseases such as early blight and Irish blight may be prevented and leaf-eating insects, which frequently cause very heavy losses to these crops, be destroyed.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

Keep the orchards and vineyards in a thorough state of cultivation, so as to keep down all weed growth and conserve moisture in the soil. This is important, as, if a long spell of dry weather sets in, the crop of summer fruit will suffer severely from the lack of moisture. Citrus trees should be irrigated where necessary, and the land kept in a state of perfect tilth. Spraying for codlin moth should be continued, and all pip fruit trees must be bandaged at the beginning of the month; further, the bandages must be examined at frequent intervals and all larvæ contained in them destroyed. The neglect to spray thoroughly and to attend to the bandages properly is responsible for the increase in this serious pest in the Granite Belt, and growers are warned that they must pay more attention to the destruction of this pest if they wish to grow pip fruit profitably. Fruit fly may make its appearance in the cherry crop; if so, every effort should be made to stamp out the infestation at once, as, unless this is done, and if the fly is allowed to breed unchecked, the later ripening crops of plums, peaches, apples, pears, apricots, and Japanese plums are bound to become more or less badly infested. Combined action must be taken to combat this, the most serious pest of the Granite Belt, and growers must realise that, unless they take this action and see that careless growers do not breed the fly wholesale, they will never keep it in check, and it will always be a very heavy tax on their industry. Rutherglen bug is another serious pest in this district, and is propagated by the million by careless orchardists. The best remedy for this pest is to keep the orchard clean and free from weeds. Brown rot in fruit should be watched for carefully, and, on its first appearance in a district, all ripening fruit should be sprayed with the sodium sulphide wash.

All kinds of leaf-eating insects should be kept in check by spraying with arsenate of lead, and all grape vines, potatoes, and tomatoes should be kept sprayed with Bordeaux or Burgundy mixture, the former for black spot and downy mildew, and the latter for early and late (Irish) blight.

A CLOTHES-LINE POST.

A serviceable clothes-line post was made out of an old boiler tube and a discarded waggon hub, as shown in the sketch. The boiler tube was cut to a length of 8½ feet, and sunk into the ground so that 6½ feet were exposed. Sections of gas pipe were placed at right angles through the hub, and the latter fitted snugly into

the top of the boiler tube. The construction was given several coats of paint, and withstood hard wear in the open. By using wooden plugs in the ends of the pipes, and boring suitable holes through them, the old boiler tubes may be used to build a substantial railing or fence.

ASTRONOMICAL DATA FOR QUEENSLAND.

Times Computed by D. EGLINTON, F.R.A.S., and A. C. EGLINTON.

TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

Date.	October, 1930. Rises.	October, 1930. Sets.	November, 1930. Rises.	November, 1930. Sets.	MOONRISE. Oct. 1930. Rises.	MOONRISE. Nov. 1930. Rises.
1	5.36	5.48	5.5	6.7	p.m. 12.1	p.m. 1.31
2	5.35	5.48	5.4	6.7	12.58	2.25
3	5.34	5.49	5.4	6.8	1.52	3.17
4	5.33	5.50	5.3	6.8	2.45	4.11
5	5.32	5.50	5.2	6.9	3.39	5.16
6	5.31	5.51	5.2	6.10	4.33	6.16
7	5.29	5.51	5.1	6.10	5.25	7.8
8	5.28	5.52	5.1	6.11	6.21	8.11
9	5.27	5.52	5.0	6.12	7.18	9.13
10	5.26	5.53	4.59	6.13	8.16	10.15
11	5.25	5.53	4.59	6.14	9.17	11.13
12	5.21	5.54	4.58	6.15	10.19	...
13	5.23	5.54	4.58	6.16	11.19	a.m. 12.5
14	5.22	5.55	4.57	6 16	...	12.49
15	5.21	5.55	4.57	6.17	a.m. 12.20	1.25
16	5.20	5.56	4.56	6.18	1.15	2.0
17	5.19	5.56	4.56	6.19	2.7	2.32
18	5.18	5.57	4.56	6.20	2.49	3.6
19	5.17	5.58	4 55	6 21	3.26	3.40
20	5.16	5.58	4 55	6.22	4.0	4.18
21	5.15	5.59	4.55	6.23	4.35	5.0
22	5.14	5.59	4.54	6.23	5.9	5.48
23	5.13	6.0	4.54	6.24	5.46	6.43
24	5.12	6.1	4.53	6.25	6.25	7.40
25	5.12	6.1	4.53	6.25	7.10	8.35
26	5.11	6.2	4.53	6.26	8.2	9.31
27	5.10	6.3	4.53	6.27	8.56	10.27
28	5.9	6.3	4.52	6 27	9.52	11.22
29	5.8	6.4	4.52	6.28	10.46	12.15
30	5.7	6.5	4.52	6.29	11.44	1.7
31	5.6	6.6	...	...	12.40	...

Phases of the Moon, Occultations, &c.

8 Oct.	○	Full Moon	4 56 a.m.
15 ,,	☽	Last Quarter	3 12 p.m.
22 ,,	●	New Moon	7 48 a.m.
29 ,,	☾	First Quarter	7 22 p.m.

Apogee, 3rd October, at 6.54 p.m.
Perigee, 19th October, at 5.42 p.m.
Apogee, 31st October, at 12.18 p.m.

Jupiter will rise at 1.23 a.m. on the 1st and at 12.34 a.m. on the 15th.

Saturn will rise at 10.47 a.m. and set at 12.29 p.m. on the 1st; on the 15th it will rise at 9.58 a.m. and set at 11.34 p.m.

The Moon will be in Sagittarius on the 1st, in Capricornus on the 2nd and 3rd, in Aquarius on the 4th and 5th, in Pisces on the 6th, in Cetus and Pisces on the 7th and 8th, in Aries on the 9th and 10th, in Taurus to the 12th, in Auriga and Taurus from the 12th to the 14th, in Auriga and Gemini to the 15th, in Cancer to the 17th, in Leo to the 19th, in Virgo to the 21st, in Libra to the 24th, in Scorpio to the 25th, in Orphineus to the 26th, in Sagittarius to the 28th, in Capricornus to the 31st, and in Aquarius an the 31st.

The two eclipses this month already mentioned will be the only ones visible in Australia this year. During the forty-one minutes when the Moon's partial eclipse will be observable in Western Queensland it will be interesting to notice how the toning down of the Moon's lustre will help to bring into view some of its best known features, such as the great mountains, Copernicus and Tycho, the Mare Crisium, Mare Tranquilitatis, and other great so-called seas. The Sun, being a few degrees south of the celestial equator, the shadow of the earth will be projected in a slightly northerly direction, hence the first contact of the Moon's limb with it will be only 18 degrees from the Moon's most northern point towards the west; then, instead of plunging deep into the shadow, the Moon will skim over rather than through it.

The Southern Cross will be in a horizontal position, 30 degrees west of the south celestial pole, at 6 p.m. on the 1st and at 4 p.m. on the 31st October.

4 Nov.	○	Full Moon	8 28 p.m.
13 ,,	☽	Last Quarter	10 27 p.m.
20 ,,	●	New Moon	8 21 p.m.
28 ,,	☾	First Quarter	4 18 p.m.

Perigee, 15th November, at 4.30 p.m.
Apogee, 28th November, at 8.54 a.m.

Soon after midnight on the 7th the Moon will occult Eta Tauri, a star of about magnitude 2·9, which is very near the Pleiades. This will be interesting, especially to observers with telescopes.

Mercury will pass from west to east of the Sun on the 7th, it will be on the far side of its orbit, and, of course, invisible.

Jupiter will appear to reach the stationary point in its march eastward on the 8th; it will then appear to move backwards towards the west until 15th March next, when it will again appear to be near the middle of the constellation Gemini.

For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S., add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhat about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

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Event and Comment.

The Current Issue.

CONTINUING his history of the Queensland sugar industry, Mr. Easterby describes interestingly its development on the technical side. Another instalment of Mr. Currie's paper on the Brown Cutworm is added. Mr. Quodling's account of pasture experiments on newly reclaimed pear land at Palardo will be welcomed by all interested in the extension of land settlement. Seed maize improvement work is reviewed by Mr. McKeon. Major Cory has some seasonal notes on mammitis and lung worms in calves; while diseases of the pig are further discussed by Mr. Shelton. Mr. Carew continues his observations on farmers' sheep and wool, including the management of small flocks. The prospects of extending Australian trade with Eastern Asia are reviewed by Colonel D. E. Evans, who, after attending the recent World's Engineering Congress in Tokyo, toured extensively in Japan, Korea, Manchuria, and China. Well supplied regular features make up a very readable issue.

Native Flora.

HEARTY approval was given by Parliament to a Bill for the preservation of our native flora, which was introduced recently by the Minister for Agriculture and Stock (Mr. H. F. Walker). Mr. Walker said that the measure was one that had been needed for a long time past. On the numerous islands along the coast of Queensland there was a great wealth of vegetation, including staghorns, elkhorns, orchids, and ferns; but many of the islands had been denuded of their floral wealth for private gain. The more general use of motor cars and motor boats had aggravated the evil. It was proposed under the bill to protect our beautiful and, in many respects, unique vegetation, not only in the islands and the coastal districts, but also that of other parts further inland.

Agriculture in Queensland.

IN his annual review of departmental activities presented to the Minister for Agriculture and Stock (Mr. H. F. Walker), the Under Secretary (Mr. E. Graham) says that the past year was remarkable for a steady agricultural advance in Queensland. A general movement towards higher production standards was also apparent in the period under review.

In a State like Queensland, with its enormous territory and wide range of soils and climate—temperate, sub-tropical, and tropical—there can be little uniformtiy in rural conditions. The agricultural situation for the year was, however, much more even from the standpoint of production than the preceding one, and reviewing the whole period the brighter aspects predominated. Substantially larger returns were obtained from all sources of rural wealth, and present prospects are a sound basis for healthy optimism. There are indications, too, that the current agricultural year will provide further evidences of complete recovery from a series of adverse seasons. This is demonstrated by increased production, and numerous signs of progress in the improvement of manufacturing processes and marketing arrangements.

New gains have been recorded in field efficiency as well as by results of well-directed efforts towards more systematic marketing of primary products. There is a general realisation, however, that the farming problem is not solely one of production; it is also distinctly one of marketing. Price depression in some commodities was a natural consequence of a glutted domestic market. The year's experience shows that the demand side of the equation calls for further careful study and satisfactory adjustment. The strengthening of marketing machinery by which products are fed adequately into the ordinary trade channels is required, to avoid over-supply or shortage and keep prices at a reasonable level. The need of economic information on which wise adjustment may be based is becoming each year more insistent.

It is pleasing to report that farmers themselves are displaying a tendency to study closely influencing commercial factors, and also to look for and apply economic intelligence in planning their seasonal programme. This is being done much more than formerly, and from a development of this tendency has arisen a call for more relevant information on crop demand and methods of disposal.

There was a considerable expansion of acreage during the year, and crops generally moved to market in increasing volume.

In departmental activities, considerable progress was made, and a wide scope of instructive, constructive, and administrative effort was successfully covered.

Crop Yields for the Year.

THE wheat yield for the year was the highest yet attained in Queensland, and surpassed all expectations. The harvest returns were 4,235,172 bushels, as against 2,515,561 bushels for the previous year. The grain was of good milling quality. This fine result was due, apart from timely rains, to careful and thorough cultivation, which is becoming characteristic of wheat-farming in Queensland. Good progress was made in wheat-breeding at the Roma State Farm. Varieties bred there were sown largely. They have proved, in the main, good yielders, and are becoming more favoured each season. The value of the wheat breeding and extension work of the Department is becoming increasingly evident. Varieties and types evolved have survived searching tests under practical field conditions. Breeding plots were established at several suitable centres, and the varietal trials entered on thereat represent a continuity of the work carried on from season to season. The system, in brief, is the testing of new Roma crossbred wheats under actual working conditions, the elimination of undesirable varieties, and the propagation of the selected strains. Included in the trials are 240 new Roma crossbreds and forty standard varieties.

A seed wheat improvement scheme approved by the Department and the State Wheat Board was made effective. Satisfactory results were obtained, both as regards yield and general field behaviour of the wheats involved. Growers have co-operated heartily in this work, and purpose extending their acreages as a result of the successful operation of this scheme.

In the Central Division grain-growing is extending gradually, particularly in the Dawson Valley. The possibilities of a more rapid extension in Central Queensland are being explored by the Department, and to that end varietal trials are being carried out in different localities. Last season Dululu on the Dawson, and Retro in the Capella district, were the main centres of these activities. Though the rainfall was very light, satisfactory yields were bagged.

The usual annual crop competitions were held in the Warwick and Toowoomba districts; and as a stimulus to farming efficiency, their importance is becoming

more widely recognised. Their educational value is also appreciated by all engaged in grain production.

Although the presence of "flag smut" was reported from many localities in the 1928 season, it is noteworthy that in the next succeeding crop very few individual stands were affected, and where there was an appearance of disease it was present in only a minor degree. This favourable condition may be attributed to the acceptance of precautionary measures advocated by the Department for checking the disease, and to the nature of the season.

The consensus of opinion is that marketing arrangements have improved under the recent agreement between the Wheat Board and the millers. This agreement has also had a stabilising effect on prices.

A considerable increase in acreage under crop is expected this year. The present crop prospects are good, though early planted wheat is too far advanced for this time of the year, as a result of over-generous winter rains.

Weather conditions during the planting season were not generally favourable for maize, and early crops were consequently light. The late-sown crops had the advantage of the December rains and prospered accordingly. Market values were high, especially when only limited supplies were available at the beginning of the season. Heavy summer rains marred the crop prospects on the Atherton Tableland. "Rust" occurrence was one of the results. A dry February, however, helped to create a favourable balance of seasonal circumstances.

Satisfactory progress is being made in seed maize improvement, and the demand for seed of improved varieties evolved by departmental officers is constant, and available supplies are eagerly sought. The value of this work was made manifest at the Royal National and other shows where exhibited grain illustrated the success of the departmental breeders. The principal varieties of maize now grown in Queensland are of departmental origin. This is the outcome of systematic breeding and regular distribution of pure seed.

Upwards of 100,000 bushels of malting barley were produced last season on the Darling Downs. Individual yields were high and the quality was uniformly good. The whole crop went into local consumption. The current season's sowing has had the advantage of an excellent start and high yields are anticipated, also improved marketing arrangements under the Barley Pool Board which was constituted in the course of the year. The development of improved varieties is in hand. Field officers are testing some very promising barleys, including several new crossbreds, the product of the Roma State Farm. Special attention is being given to these comparative tests in order to assist in the revival of barley-growing on the Downs. For the same purpose seed of the Californian brewing type has been imported from England for trial and propagation.

The testing of suitable varieties of oats for the purpose of determining their qualities for grain, hay, and green fodder, respectively, was continued during the year with satisfactory results.

Production of canary seed increased very substantially, 280 tons being harvested, as against 50 tons, approximately, in the previous year. As this crop is grown in no other State and annual Commonwealth requirements are about 1,500 tons, it certainly warrants more attention from Downs farmers. The acreage planted this year promises, on present prospects, to produce sufficient seed for Australian needs. Its grazing value, too, is considerable, though it is susceptible to dry-season checks. In furtherance of our efforts to bring this crop into more general and regular cultivation, special plots were established successfully for the purpose of raising enough seed of an improved strain to extend its cultivation.

The cultivation of root, fodder, and other field crops is covered by Mr. Graham's report; also fertiliser trials, mainly with winter fodders. Increased attention has been given to onion-growing in the Central Division on a scale large enough to supply local and Northern requirements. For the guidance of farmers, variety trial plots were established in several centres, and satisfactory results were achieved.

In the course of the year consideration was given to the possibility of opening up new furrows in agricultural production in Queensland, and the extension of tobacco cultivation has been advanced substantially. Progress was made in experimental work, particularly in the northern division of the State.

In Queensland, we have a promising field for the production of bright, flue-cured leaf of good texture and smoking quality. Results of our new experiments, so far, go to show that we may in the not far distant future be able to supply an appreciable proportion of the tobacco leaf required for Australian use. The economic importance of this prospective development may be measured by the fact that tobacco to the value of more than £2,000,000 is imported into the Commonwealth annually.

THE QUEENSLAND SUGAR INDUSTRY.

By H. T. EASTERBY, Director, Bureau of Sugar Experiment Stations.

PART XI.

(c) Mills and Milling Work.

THE history of the rise of sugar-milling in Queensland is an intensely interesting study. Comparatively speaking, it is not so many years ago that sugar manufacture was commenced in this State on a crude and insignificant scale, and when one looks back from the fine up-to-date sugar-mill at Tully, for instance, costing some £750,000 and capable of crushing over 200,000 tons of cane in a season, to the humble crushing plants of the very early days worked by horse or cattle power, it is apparent how far we have progressed in the last fifty or sixty years. But to the pioneers of the sugar industry in Queensland, those who worked hard early and late in clearing land, planting, and making sugar, a due meed of credit must be given. They took all the risks of an unknown industry, and we have but followed in their footsteps with better knowledge and improved facilities.

As a matter of interest to the present-day manufacturers of sugar, a description of one of the old early primitive sugar-mills at St. Helena, driven by horse power, is given below, taken from a book on the sugar industry published in 1870, and written by Mr. Angus Mackay:—

> "The mill now at work at St. Helena is a low-priced but good machine for parties cultivating from 10 to 30 acres of cane. It is a vertical horse-power mill, obtained from Messrs. Smellie and Co.'s foundry, Brisbane, at a cost of £120. This mill consists of three vertical rollers, each 18 inches in diameter, 15 inches high, and well secured with iron bolts through cast-iron plates at the top and bottom. To secure an elevation sufficient for the fall of the juice into the clarifiers and from the evaporating pans, the mill is erected upon rising ground, by which means a fall of about 5 feet was obtained, and this was found sufficient for all purposes. A passage 10 feet wide and 6 feet high should be made under the horse walk, which allows of a dray being backed clean up to the rollers. Megass and other refuse can be taken away by the same means. The mill is placed about 20 feet from the end of the boiling house to give the horses a sufficiently roomy walk. The horse shafts or poles, 18 feet long, are four in number, so that two or more horses can be employed at one time. For a mill of this power six horses are necessary to work (say) ten hours a day; and if kept steadily at work during that time sufficient cane could be crushed to produce liquor for about half a ton of sugar. The boiling house at St. Helena is 40 feet long by 25 feet wide, with 12-feet wall plates; it is built of hardwood and pine and covered with shingles. There are six windows on each side, part Venetian work and part glass, with an open space of about 18 inches on either side, near the eaves, the full length of the building; there is also a turret, 3 feet square, on the top of the building filled with louvre boards, which completes the ventilation. In this building are fitted the clarifiers, evaporating pans, and tache. The two clarifiers, each capable of containing 200 gallons, are at the end nearest the mill and connected therewith by a galvanised-iron pipe, through which the juice is conveyed. They are set in brickwork with separate furnaces and flues, the latter leading into the

main flue. They are so placed that the bottoms of the clarifiers are 4 inches above the top of the evaporating pans, and at a right angle with them. The furnace, tache, and evaporating pans run along about 4 feet from one side of the building; the whole of the pans are set in brickwork, with a main flue passing underneath them and between the clarifiers. The furnace for this battery of pans is of Brisbane firebrick; it is 7 feet 6 inches long, 2 feet wide, and 2 feet high, arched over with a curve 5 feet 6 inches by 2 feet; the tache hangs at the end of the furnace, the bottom about 2 feet above the bars, whilst the brickwork is arranged for the fire to play all around it. The end of the evaporating pans is 14 inches from the lip of the tache. The evaporating pans, of iron, are joined together, and present a surface 18 feet long, 3 feet wide, and 18 inches deep, which is divided into three compartments. The flue passes under the whole length of them, between the tache and the clarifiers, having a damper at the far end. This flue is 2 feet wide and 18 inches high, and the whole range is built so that the furnace, tache, and evaporating pans fill up the space between the end of the building and the clarifiers. The length of the flue is 45 feet from the front of the furnace to the base of the chimney. The chimney, 4 feet 6 inches square at the base, is of brick on a stone foundation and is 29 feet high, with a 6-inch batter on each side. The furnace door is outside of the building. Brickwork is carried 12 inches above the lip of the tache and is then covered with sheet lead down to the lip, the form being dished out on the side nearest the evaporating pans, so that the syrup, when boiling over, may flow into them. Both the evaporating pans and the tache may be at the same elevation. The edges of the evaporating pans are bound round with hardwood battens to keep the iron from bending. The coolers are 5 feet by 4 feet at the top and 12 inches deep, bevelled on either side about 3 inches; they are of 1¾-inch cedar, and answer well, although the wood for the first day or two slightly discolours the sugar; this, however, may be avoided by filling them with boiling water two or three times. The drainers are made of the same material and are 5 feet long by 3 feet wide and 18 inches deep, bevelled 6 inches, with a false bottom of perforated zinc and a hole at the end for molasses to escape. We are now trying another plan, which, I fancy, will drain the sugar better still—that of putting canvas bags for drainers over false bottoms made of narrow battens. There are, however, so many different drainers in use that experience is necessary to determine the kind most suited for particular sugars. For the St. Helena mill canes about 4 feet in length fit best; when of greater length they are inconvenient when passing through. Two, or sometimes three, pieces are sufficient between the rollers at a time; but these must, each as it disappears, be replaced regularly to ensure uniformity of crushing without more than ordinary wear and tear to the machinery. As the juice reaches the mill bed it runs into galvanised-iron piping, attached to which are two strainers of fine wire gauze, and thence into the clarifiers. After the bottom of one of the clarifiers has become covered with juice a slow fire is lit underneath, and increased as the clarifier fills, the heat being regulated accordingly. When a clarifier is full quicklime, previously prepared by mixing it with water until it has attained the consistency of cream, is added, according to the acidity of the juice, and tested by litmus paper, and if the paper

retains its original tint sufficient lime has been added to the juice. No stated quantity of lime can be used with certainty in any particular variety of cane as its acidity varies considerably; each pan is therefore tested in this manner. We have used lime made from both coral and shells, but find neither answers so well as stone lime from Rockhampton. Lately I have used bisulphite of lime, placed in a small receiver, over, and allowed to drop into the clarifier at the rate of about three drops per minute, or about two drops to the gallon. This is found to be a great improvement, and about one-third less lime is necessary in the liquor afterwards. The addition of bisulphite makes the sugar cleaner, and, in the event of the juice having to remain in the clarifier for some time, it is prevented from fermenting. It is, therefore, a decided improvement upon lime temper. When the clarifier is full and tempered as above it is brought up to a heat of 140 deg. Fahr. and stirred well round so as to diffuse the limewater evenly through the whole body; it is allowed to settle and then brought up to a heat of from 190 to 200 deg. and skimmed. The liquor is then allowed to run through flannel bags into the evaporating pans, most of the sediment being retained in the clarifier. Whilst the first clarifier is emptying into the evaporating pans the second clarifier is filling to undergo a similar process. A fire has before this been lit under the tache, which was previously filled with water to prevent it from injury. The heat from this fire having reached the evaporating pans, the liquor is allowed to boil and evaporate in the three compartments up to a heat of 220 deg., by which time it has reached a density of 28 deg. by Beaumé's saccharometer; the water is then removed from the tache and the syrup ladled in from the nearest evaporating pan, and it is then brought to a heat of 228 or 230 deg., but not higher, as the lower the syrup is boiled up to granulation point the better the quality of the sugar, whilst a more intense heat will probably burn the syrup and discolour it. When it has reached a temperature of (say) 228 deg., the fire is withdrawn, the damper put down, and the syrup run through a long narrow pine trough to the coolers on the other side of the building, where it is well stirred and allowed to remain for twenty-four hours. In that time it granulates. From the coolers the sugar is transferred to the drainers, where it is allowed to remain as long as possible, the time required for the drainage of the molasses from the sugar varying with the nature of the drainers and the state of the atmosphere.

"In consequence of the great difficulty of drying sugar from the variableness of the atmosphere, a centrifugal machine is being constructed wihch is intended to work either with a small steam engine or hand labour. Seventy per cent. was mentioned as being good extraction."

As time went on the inadequate horse and cattle mills were abandoned by degrees. These were mostly of a vertical nature.

Horizontal mills consisting of three heavy cast-iron rollers accurately turned and generally slightly grooved on the face and fixed between two cast-iron frames securely bolted to a cast-iron bed plate, which also formed the receptacle for the expressed juice, began to come into use. In a mill of this description two rollers were below and placed parallel to each other and one above. These rollers were from 12 inches to 3 feet in diameter, and the speed found most advantageous for expressing the

juice from the canes was at the rate of 20 feet per minute. The canes were fed from a table, and after being squeezed between the first and top under roller were guided between the top and second under roller by a plate which is still called the "dumb turner." Steam engines were used for driving these horizontal mills, the class of engine most commonly used being the horizontal high-pressure engine—simple in construction, strong and substantial, the working parts being highly finished, other parts being black and painted. It was stated that many preferred to have a highly polished engine, but that such an engine would cost about 30 per cent. more than a black engine, but the bright work cost a good deal more to keep clean.

Steam also began to be used for boiling the juice, and centrifugal machines came into use before 1870 for separating the grain from the molasses, while vacuum pans were being talked about, and at some little time afterwards began to be installed.

It is perhaps as well, as the knowledge of facts concerning the early history of sugar-mills becomes in the course of time more and more difficult to obtain, that I should place on record the names of the earlier plantations or their owners as far as I have been able to obtain same.

NAMES OF OLD PLANTATIONS AND OWNERS (WHERE POSSIBLE) PRIOR TO 1875.

District.	Locality.	Name of Plantation.	Names of Owners.
Southern	Nerang	Bundall	Holland Miskin & Co.
Do.	do.	Birribi	Philpott Bros.
Do.	do.	Benowa	R. Muir
Do.	Logan and Albert	Loganholme	Fryar and Strachan
Do.	do.	Sederhoff	Palm
Do.	do.	Noyea	Gartside, Muir and Black
Do	do.	Pinwells	..
Do.	do.	Beenleigh	Davy and Gooding
Do.	do.	Yatala	Witty
Do.	do.	Helensvale	White and Robinson
Do.	do.	Miles and Ardates	..
Do.	Oxley Creek	Francis	..
Do.	do.	Jamieson's	..
Do.	do.	Berry's	..
Do.	do.	Grimes and Co.'s	..
Do.	do.	Dr. Waugh's	..
Do.	do.	Ormiston	Hon. Louis Hope
Do.	do.	M'Leod's	..
Do.	St. Helena	St. Helena	Government
Between Brisbane and Mary-borough	..	Eton Vale	Canny and Moreton
	..	Alford	Farquhar and Dunn
	..	Waitemata	T. Wood
Do.	..	Irrewarra	R. Tooth
Do.	..	Yarra Yarra	R. Tooth
Do.	..	Yengarie Refinery	Tooth and Cran
Do.	..	Iindah	Ramsay Bros.
Do.	..	Iveragh	M. Canny
Do.	..	Mona	R. F. Clarke
Do.	..	Iwood	C. D'Oyley Aplin
Do.	..	Dunrobrum	J. M. Illidge
Do.	..	Ferney	P. O'Kelly
Do.	..	Frankston	Capt. Jeffrey, R.N.
Do.	..	Antigua	Hon. Brown
Do.	Tinana Creek	Magnolia	..
Do.	Maryborough	Maryborough	Maryborough Sugar Co.

NAMES OF OLD PLANTATIONS AND OWNERS (WHERE POSSIBLE) PRIOR TO 1875—*continued.*

District.	Locality.	Name of Plantation.	Names of Owners.
Mackay ..	Mackay ..	Balmoral	W. Hyne
Do. ..	do.	Medowlands.. ..	Fitzgerald
Do. ..	do.	Davidson's	..
Do. ..	do.	Hewitt's	..
Do. ..	do.	Branscombe.. ..	Martin and Long
Do. ..	do.	Nebia	Ganes and Fitzsimmons
Do. ..	do.	Dumbleton	Lloyd and Williams
Do. ..	do.	Pioneer	Spiller
Do. ..	do.	Foulden	Amherst and Co.
Do. ..	do.	River Estate ..	Long and Co.

In 1880 the sugar-growing and sugar-milling areas were split up as follows:—

1. The Southern district, extending from Nerang Creek near the border of New South Wales to Maroochy Creek (Nambour);
2. The Central or Wide Bay district, from about Maroochy to Bundaberg;
3. The Mackay district;
4. The Cardwell district.

Taking the Southern district first, there were mills at Nerang Creek, several mills about Coomera and Beenleigh, mills at Mount Cotton, Redland Bay, Cleveland, Hemmant, St. Helena, Indooroopilly, Oxley, Sherwood, Bald Hills, Burpengary, Caboolture, Mooloolah, and Maroochy.

The Central sugar-growing district ran north from Maroochy, but there was no sugar-mill before Tiaro, then came mills at Antigua, Tinana Creek, the Mary River, and Maryborough. At Bundaberg there were then three mills.

The Mackay district was a compact locality in 1880 with sixteen sugar-mills working close to one another, chiefly on the Pioneer River.

In the Cardwell district there were two mills on the banks of the Herbert River, and at Cairns there were another two.

At the time Mr. Roth wrote his "Report on the Sugar Industry in Queensland" (viz., in 1880), he said that 114 mills had been started in Queensland.

At that period the manufacture of rum was a side line in Queensland, and in 1875 there were fourteen stills at work; this number was reduced to nine in 1878.

The Gibson family, now so well known in connection with the fine up-to-date plantation and sugar-mill at Bingera, near Bundaberg, commenced the manufacture of sugar first at Doughboy Creek (Hemmant) on the Brisbane River. The plate accompanying this section is of the old mill, and in it may be seen the late Hon. Angus Gibson and his father. At that time and when the Gibsons opened up Bingera there were four sons, all subsequently well known and prominent in the industry—viz., Angus, William, James, and John. Of these, the only survivor is Mr. John Gibson, but the family traditions are worthily carried on by Mr. W. G. Gibson, Dr. A. J. Gibson, and Mr. A. L. Gibson, who manage the Bingera Sugar Company and plantations.

PLATE 134.—GIBSON BROS. FIRST SUGAR MILL, HEMMANT, DOUGHBOY CREEK, NEAR BRISBANE.

Included in the group are the late Hon. Angus Gibson and other members of a family that has contributed much to the success of the sugar industry in Queensland.

At the time of which we are now writing—1878 to 1880—Mr. Roth says:—

> "At Yengarie Refinery, Maryborough district, the juice is brought from the neighbouring mills partly in punts and partly in pipes, as the greater number of the mills crush the cane only (the juice is limed at the rate of 15 lb. to every 100 gallons of juice). The refinery gives the planters for 1 gallon of juice at a density of 10 deg. Beaume, 1 lb. of sugar; for every degree more or less 10 per cent. is added or deducted."

This was considered to be equal to £21 per ton of sugar in 1879—i.e., for every 2,240 gallons of juice at 10 deg. Beaume delivered at Yengarie the planter received £21. Some of the planters were of the opinion that it paid them better to sell their juice thus; others found they could make the sugar more profitably themselves.

Even as far back as those days there were differences of opinion between those millers who bought cane and the farmers who sold cane, the small settlers complaining that they were badly treated by the mill-owners; but, on the other hand, it was stated that these small settlers belonged to the most prosperous agriculturists of the colony.

It is rather amusing to read in literature published about this time that one of the claims for a sugar-mill called the "Victor"—a small horse-power mill—was that it could be easily shifted and reset, and it was asked by a critic to fancy an Australian humping a sugar-mill about with him like the itinerant sugar manufacturers of India and China.

By 1880 there were fifteen vacuum pans in Queensland, three in the South, four in the Central, seven in the Mackay, and one in the Herbert River districts. At that time the general demand was for a rather medium-sized white-grained sugar and yellow grocery sugars. About two-thirds of the sugar made went into direct consumption and not through the refineries. It was stated that Queensland sugars lacked the brightness and "bloom" of a good Demerara sugar, which was attributed to defective clarification.

[TO BE CONTINUED.]

Bureau of Sugar Experiment Stations.

ENTOMOLOGICAL HINTS TO CANEGROWERS.

By EDMUND JARVIS.

Cane Beetles are Likely to Appear this Month.

The fall of about 9 inches of rain experienced last month (October) has helped to provide more moisture in the upper subsoil than is usually met with during the beginning of November. In the event, therefore, of additional showers being obtained about the middle of this month, greyback beetles are likely to make an earlier emergence from the soil than usual. Since the year 1914, eight annual emergences have occurred in December, five in November, two in October, and one in January.

Make Arrangements for Collecting Cockchafers.

On cane areas known from past experience to be subject to grub attack, growers should start collecting "greybacks" from the foliage of their feeding-trees directly these beetles appear on the wing.

No time should now be lost in locating the position of favourite food plants, such as native figs (*Ficus pilosa, F. glomerata, F. nesophila*, &c., *Eucalyptus tessalaris* ("Moreton Bay Ash"), or others on which these insects have been observed to congregate, chancing to grow close to headlands of their canefields. To facilitate

collecting, clear away all litter or vegetation from the surface of the ground under such trap-trees. Continue the work each day for about five weeks, dating from the beginning of the flighting period.

Make a note of the date of this emergence, as it may prove very useful later on in the event of a farmer wishing to fumigate his soil for cane grubs, as such information would enable him to determine the age of the grubs present, together with the correct time for commencing control work.

Do Not be Without a Spray Pump.

However small the cane farm, no grower can afford to be without the means of fighting such insect pests as ''army worms,'' leaf-eating beetles, or caterpillars, &c. Such invasions are best combated at the right time—viz., when first noticed—as delay of a week or so while sending away for apparatus and chemicals often means material financial loss which might have been avoided. In addition to controlling the ravages of various cane pests, a spray pump often proves useful for treating insects attacking fruit and vegetables, or spraying animals for ticks, &c.

A good bucket pump, which costs under £3, can be recommended as very suitable for applying disinfectants, insecticides, water-paints, limewash, &c., and is designed with a view to being easily fitted to the inside of a small barrel, Kerosene tin, or similar container for holding the solution to be applied. For field work, a knapsack pump will be found very useful when spraying cane leaves attacked by ''army worms'' or other leaf-eating caterpillars. One having a liquid capacity of about 3½ gallons can be carried conveniently, and only costs about 45s.

When buying a spray pump, see that it is made of brass or copper, and fitted with an effective agitator and large compression cylinder ensuring even distribution.

Remember that all such machines last very much longer if cleaned thoroughly after use, particularly if corrosive liquids have been sprayed.

ENTOMOLOGICAL EXHIBIT AT INNISFAIL SHOW.

An interesting exhibit by the Bureau of Sugar Experiment Stations was taken from Meringa Entomological Station to the Innisfail Show in September. The exhibit comprised showcases depicting the life-histories of all the principal cane pests, charts showing enlargements of the more important ones and their parasites, and spirit specimens of the chief grubs attacking cane. Samples of poisons used in combating grubs were also shown, and a general collection of North Queensland insects, principally of those insects more nearly related to the various pests.

Assisted by a pathological exhibit and one of seedlings from South Johnstone Experiment Station a very comprehensive display was staged, and the farmers attending the show evinced great interest in it, numerous questions concerning the exhibit and cane in general being asked by visitors.

The show committee at Innisfail are to be congratulated on its success, and thanks are due to its members for their assistance in arranging and protecting the Meringa exhibit.

SUGAR LEVIES.

Following is the result of the referendum in connection with the undermentioned sugar levies:—

Defence Fund Levy.

On the making of a levy by the Queensland Cane Growers' Council at the rate of 1d. per ton of sugar-cane harvested during the current season for the purposes of a defence fund—

	Votes.
For	1,997
Against	1,126

Marian Central Sugar-mill Levy.

The making of a levy of 1d. per ton on all suppliers of cane to the Marian Central Sugar Mill during the present season, to be expended only in the interests of defraying the costs of employing a farmers' representative at the Marian Central Sugar Mill—

	Votes.
For	99
Against	75

A bare majority only was necessary on these questions. The proposals were therefore carried.

THE BROWN CUTWORM (*Euxoa radians* Guen.).

By G. A. CURRIE, B.Sc.

PART IV.

CONTROL MEASURES.

THESE may be dealt with under the four headings—

(1) Cultural,

(2) Traps,

(3) Poisons,

(4) Biological.

Cultural.

Considering the four stages in the life history of the insect—egg, larval, pupal, and adult stages—it is considered that the eggs are not likely to be open to control by cultural means; the moths are immune, the caterpillars are subject to a certain degree, and the pupæ are particularly open to control by this method.

Keeping weeds down in fallow lands prevents the breeding-up of larvæ in these areas, while ploughing-in of weeds will eventually prove fatal to most of the larvæ which have been feeding on them. It is not true that all larvæ will perish if their food is ploughed in, for some will finish their growth on the plants in the soil, while others in the sixth instar will succeed in pupating even if not full fed. The fifth instar is, however, incapable of pupation.

Some laboratory experiments were tried to test the length of time the larvæ could exist without food but limitation of material inhibited extensive experiments in this connection. The results are shown in Table VIII.

TABLE VIII.
LARVAL RESISTANCE TO STARVATION.

Average Temperature.	Instar of Larva.	Days Starved.	Remarks.
62 deg. Fahr.	V.	22	Died
65 deg. Fahr.	VI.	17	Pupated successfully
70 deg. Fahr.	V.	11	Died
72 deg. Fahr.	V.	12	Died
70 deg. Fahr.	VI.	15	Died
75 deg. Fahr.	VI.	5 + 8*	Pupated successfully

* Starved for 5 days then fed and starved for 8 days more.

Fallow ground with a loose surface covered with weeds is an ideal breeding place for *Euxoa radians*, so fallows should be kept as clean as possible. Sometimes cutworms will breed up in a crop which has been allowed to become weedy, without attacking the crop itself, but living on the weeds. Such weedy crops are a menace as breeding places for the cutworms, which may attack cultivated crops in their next generation.

The fact that cutworms can live for many days without food shows that a weedy fallow in which cutworms are known to be present should not be planted up with a vulnerable crop without an interval of about three weeks elapsing between preparation of the ground and planting.

In extreme cases *Euxoa radians* has been known to act as an army worm over a short distance, that is to say, it has bred up and fed in a certain area until the larvæ have become too numerous for the food supply. They then marched from the area towards some new feeding ground. The destruction of the feeding ground (if weeds) when the larvæ are seen to be numerous may be possible under certain circumstances, or a trap furrow ploughed to arrest the advance.

The form of furrow suitable for checking the advance of *Euxoa radians* should have the following properties:—

(1) Side next to area to be protected should be steep or overhanging.

(2) This side should be crumbly and not moist and caked. A ridge of crumbly earth on top of the steep slope usually thrown up by a swing plough in friable soil will be very effective in checking exit from the furrow.

(3) No roots or pieces of debris should form a bridge from the bottom of the furrow to the top.

(4) If the furrow is perfect and in a friable soil, a depth of 6 inches is sufficient, but 8 inches or 10 inches forms a better protection under ordinary conditions.

To ensure success, trap furrows should be baited with poison bait when the cutworms are seen in them.

The pupa, spending the winter in the soil as it does, is open to destruction by ploughing. Such ploughing should always be done before the end of August if possible so that few will have emerged as moths.

Cultivation between the rows in a field attacked will also destroy some pupæ at any time of the year.

Traps.

There are various forms of light traps and fermenting bait traps used for capturing moths.

The "Andres-maire" trap appears to give considerable success against the moths of *Agrotis ypsilon* Rott. in the Tal lands of Mokamah, India.[13] This success is obtained in an area on which the moths congregate in great numbers at a particular time, and so are particularly open to such means of control.

Fermenting molasses for bait traps has been used with some success in Russia and other countries, against cutworm moths. In Russia open pans of molasses were used with success, but the same method used in America gave negative results. The method, at present somewhat uncertain, may yet prove of considerable value in cutworm moth control. In Queensland[14] traps containing fermenting apple juice and vinegar set out to catch codling moths caught considerable numbers of cutworm moths.

In Queensland the agricultural areas are scattered and much broken up by virgin bush, and so appear altogether unsuited to the use of traps in most places. Although traps may be found to be of local use they were not thought sufficiently promising to experiment with on an extensive scale, as poison baiting for the caterpillars recommends itself to the farmers and is a fairly sure remedy.

Poisons.

Poison baiting for cutworm larvæ has been practised for many years. As poisons, various arsenicals and fluorides have been successfully used. As media for carrying the poison, wheat bran, shorts, horse dung, chopped greens, carrots, and prickly-pear have been used with success.

A prickly-pear bait of some interest has been developed in South Africa.[15] The preparation of this is given as follows:—"To 2 gallons of soft water add 6½ oz. of commercial sodium fluoride (95 per cent. pure), and stir. Chop up an equal volume (2 gallons) of prickly-pear into pieces the size of a thumb. The pieces should be cut clean and not crushed. Add the prickly-pear to the solution and stir. Soak overnight, preferably stirring once or twice during soaking. Drain through a coarse sack or wire mesh, and save the residue, which will keep indefinitely, for house-fly bait."

An advantage of fluoride over arsenical poisons is that fluorides are much less poisonous to stock and human beings. This bait has not been experimented with in Queensland, but the formula is given in case any farmer should wish to try it.

In Queensland wheat bran is readily available everywhere and arsenical poison is usually easy to procure, so experiments with *Euxoa radians* have been confined to testing the best strength of Paris green-bran baits, calcium arsenate-bran baits, and calcium arsenate spraying to control the larvæ.

Poisoning Experiments.

In the first experiment the relative efficacies of Paris green bran baits, and spraying the seedlings of cotton with calcium arsenate were tested.

PLATE IX.
Type of cage used at Cotton Research Station, Biloëla, in experiments to control cutworms by poison baits.

Rows of cotton seedlings about a week old were selected and three cages of the type shown in Plate IX.* were placed over them.

Cage No. 1.—Eighty-three cutworm larvæ put in (fourth, fifth, and sixth instars). Paris green bran bait, 1 lb. Paris green, 24 lb. bran. Moistened with water and sweetened with molasses.

This was freely sprinkled amongst the seedlings.

Cage No. 2.—Eighty-three cutworm larvæ put in (fourth, fifth, and sixth instars). Seedlings sprayed freely with calcium arsenate, 1 lb. powder shaken up in 8 gallons water.

Cage No. 3.—Eighty-three cutworms put in (fourth, fifth, and sixth instars). Seedlings untreated—control.

The following morning the cages were lifted, the cutworms searched for in the soil and removed. A considerable number could not be found because of the area to be worked over and the burrowing habit of the larvæ. Results are given to fifth day; after that the cause of death is uncertain.

Experiment No. 1.—Exposed one night only, afterwards fed on pigweed.

TABLE IX.

Day.	Paris Green Bait. 1lb. to 24lb. Bran.			Calcium Arsenate Spray. 1lb. to 8 galls. Water.			Control.		
	Alive.	Dead.	Total Recovered ex Soil.	Alive.	Dead.	Total Recovered ex Soil.	Alive.	Dead.	Total Recovered ex Soil.
First	41	35	76	65	2	67	69	1	70
Second	26	15	..	53	12	..	65	4	..
Third	19	7	..	41	12	..	62	2	..
Fourth	14	5	..	32	9	..	55	7	..
Fifth	8	5	..	29	3	..	51	4	..
Recovered dead on fifth day—Per Cent. ..	89·5			56·7			26·0		

Experiment No. 2.—Repetition of Experiment No. 1, but exposed to baits and poison for three nights instead of one.

TABLE X.

Day.	Paris Green Bait. 1 lb. to 24 lb Bran.			Calcium Arenate Spray. 1 lb. to 8 galls. Water.			Control.		
	Alive.	Dead.	Total Recovered ex Soil.	Alive.	Dead.	Total Recovered ex Soil.	Alive.	Dead.	Total Recovered ex Soil.
Fourth	7	53	60	59	15	74	75	2	77
Fifth	4	3	..	52	6	..	73	1	..
Recovered dead on fifth day—Per Cent. ..	93·2			30·0			5·2		

* A type of cage made to the specifications of Mr. L. M. Hodge, manager of the Cotton Research Farm, Biloela.

It will be seen that spraying the leaves of seedlings with poison was not nearly so effective in killing the cutworms as the poison baits, and spraying has the added disadvantage that the leaves are considerably damaged by the caterpillars before the poison stops them.

The following experiment was carried out to determine the effect of different concentrations of Paris green poison in baits. The same cages were used but gauze bottoms were tacked on so that a complete recovery of cutworms after exposure was effected. Loose soil was provided for them to burrow into and pigweed was liberally given.

Experiment No. 3.—Cutworms exposed to poison bait and natural food for one night, then fed pigweed only, for five days.

TABLE XI.

ONE HUNDRED LARVÆ PER CAGE.

Day.	Paris Green Bran Bait. (1 lb. P.G. to 32 lb. Bran.)		Paris Green Bran Bait. (1 lb. P.G. to 40 lb. Bran.)		Paris Green Bran Bait. (1 lb. P.G. to 48 lb. Bran.)		Control. (Pigweed and Moist Bran.)	
	Alive.	Dead.	Alive.	Dead.	Alive.	Dead.	Alive.	Dead.
First	74	26	89	11	92	8	99	1
Second	34	40	42	47	45	47	94	5
Third	22	12	27	15	28	17	92	2
Fourth	14	8	15	12	15	13	90	2
Fifth	9	5	10	5	13	2	86	4
Dead fifth day—Per Cent.	91·0		90.0		87·0		14·0	

Experiment No. 4.—Paris green bran bait, and calcium arsenate bran bait compared. Cutworms exposed to poison bran baits and pigweed for one night only, then fed pigweed.

TABLE XII.

SIXTY LARVÆ PER CAGE.

Day.	Paris Green Bran Bait. (1 lb. P.G. to 16 lb. bran.		Paris Green Bran Bait. (1 lb. P.G. to 24 lb. bran.)		Calcium arsenate bait. (1 lb. C.A. to 16 lb. bran.)		Calcium arsenate bait. (1 lb. C.A. to 24 lb. bran.)		Control. (Pigweed and bran only.)	
	Alive.	Dead.	Alive.	Dead.	Alive.	Dead.	Alive.	Dead.	Alive.	Dead.
First ..	38	22	40	20	54	6	58	2	59	1
Second ..	25	13	23	17	24	30	47	11	57	2
Third ..	12	13	11	12	10	14	22	25	56	1
Fourth ..	9	3	10	1	4	6	17	5	54	2
Fifth ..	8	1	8	2	2	2	14	3	52	2
Dead fifth day Per Cent. ..	86·7		86·7		96·7		76·7		13·4	

All the foregoing experiments were carried out with larvæ in the later instars, fourth, fifth, and sixth, so a few experiments were tried with small larvæ. A very limited number of larvæ was available for this work, so the number per experiment is small. The experiments had to be carried out in glass jars owing to manipulation difficulties.

Experiment No. 5.—Cutworms in instars I., II., and III., exposed to poison baits and pigweed for one night. Bait was more moistened than that used for big cutworms.

TABLE XIII.—TWENTY-THREE LARVÆ PER JAR.

Day.	Paris Green Bran Bait (1 lb. P.G. to 24 lb. bran).		Paris Green Bran Bait (1 lb. P.G. to 24 lb. bran).		Paris Green Bran Bait (1 lb. P.G. to 16 lb. bran).		Control. (Fed pigweed and bran.)	
	Alive.	Dead.	Alive.	Dead.	Alive.	Dead.	Alive.	Dead.
First	19	4	19	4	13	10	21	2
Second	11	8	5	14	13	..	21	..
Third	11	..	5	..	8	5	21	..
Fourth	7	4	2	3	1	7	20	1
Fifth	4	3	1	1	..	1	18	2
Dead fifth day—Per Cent.	82·6		95·7		100·0		21·7	

In all cases the natural food of the cutworms (pigweed) was placed in the cages so that they could avoid the poison bait if they preferred. In the case of the controls moistened and sweetened bran was fed as well as pigweed, to check the effect of bran on them apart from the effect of the poison.

It will be seen from the tables that Paris green in strengths from 1 in 16 to 1 in 50 lb. bran is an effective poison for the larvæ of *Euxoa radians*. Calcium arsenate with bran at a strength of 1 in 24 lb. bran is slower in action than Paris green and has a lower percentage kill than any of the strengths of Paris green tried. So it would appear advisable to use the greater concentration 1 in 16 lb. of this poison.

Failure to control the smaller cutworms with calcium arsenate bran mash has been reported.[16]

The experiments (Table XIII.), although not conclusive, owing to the small number of cutworms available, certainly indicate the probability of success with well-moistened Paris green bran mash.

In recommending a bran mash for field use the following points are to be noted:—

(1) Effectiveness as control.
(2) Cheapness and availability of poison.
(3) Safety in handling poison.

Paris green is the most rapidly effective poison tested. Paris green is more poisonous to human beings than calcium or lead arsenates, but its colour strikes a note of warning which serves to draw attention to its presence. It is more expensive than the other two, but can be used in greater dilution.

In mixing a bran mash it is difficult to get an even distribution of the poison when lead and calcium arsenates are used owing to their white colour, which makes them indistinguishable in the mixture. Care and thorough mixing will of course overcome this. The green colour of Paris green contrasting with the colour of the bran quickly draws the attention of the operator to a bad distribution of the poison, and this again recommends it. A bran mash mixed with Paris green will readily be seen to be poisoned if left carelessly about, but this can hardly be said of lead or calcium arsenate.

The addition of molasses to bran mash helps to keep it in a moist, attractive condition longer than if no molasses is used.

A good poison mash would appear to be the following:—

1 lb. Paris green.
1 bushel (28 lb.) bran.
1 quart molasses.
Water to moisten to a crumbly consistency.

If no molasses is available, then salt, sugar, or syrup can be added, or the mash made without any of them. It is attractive to *Euxoa radians* without sweetening. In the case of lead or calcium arsenate being on the premises it can be used as follows:—

1 lb. calcium or lead arsenate.
16 lb. bran.
1 quart molasses (optional).
Water to moisten.

Both these baits are more poisonous than may be strictly necessary, but they are on the strong side to counteract the possibility of inefficient mixing.

In all cases bran baits should be scattered under or near the plants to be protected, and applied in the evening so as to be fresh and attractive during the night when the cutworms come out to feed.

In the field in Queensland, Paris green bran bait and calcium arsenate bran bait (as recommended) have been used with complete success against *Euxoa radians* Guen., *Agrotis ypsilon* Rott., and *Heliothis obsoleta* Fabr.

Quantity of Bait Required in Rows.

In order to test the quantity of poison bait which would effectively cover the ground in the rows under the plants to be protected, experiments were carried out with moistened bran.

For plants in rows, the weight of bran necessary to sprinkle along a chain was tried, and from this figure the amount of bran necessary to protect an acre can be obtained for all different widths between the rows. In the case of cotton in Queensland, the usual width is 4 feet 6 inches, so the figures for that distance will be given.

The bait has to be distributed as thinly and evenly as possible so that the cutworms when coming out to feed at night will encounter poisoned bait readily. This is the theory on which the quantity was worked out.

It is necessary to state here that cutworms were controlled in an experimental plot of cotton at Gatton Agricultural High School and College in 1924 by placing out Paris green bran bait in lumps, the size of a walnut, at intervals of about 6 feet. The cutworms were all large ones, and they seemed to be attacted to the bait in preference to their other food.

For large areas in the field, however, most rapid distribution is obtained by scattering along the rows, and on that method is based the calculation of the quantities shown below:—

Weight of dry bran per chain, thinly distributed, 22 oz. for 12 chains $=1{\cdot}83$ oz. per chain $= 145 \times 1{\cdot}83$ oz. per acre in 4 feet 6 inches rows $= 16\frac{1}{2}$ lb. dry weight bran per acre.

Weight of dry bran per chain, heavily distributed—

12 chains required 48 oz. bran
1 chain required 4 oz. bran
145 chains required 580 oz. bran
= 36 lb. per acre in 4 feet 6 inches rows.

An actual field test over 20 acres required an average of 25 lb. per acre for an even cover along the rows of cotton seedlings in 4 feet 6 inches rows. This is about half-way between the heavy and light distributions tabulated, so it is probably a safe figure to keep in mind when mixing up bait in quantity.

Amount of Bait Required in Broadcasting.

This will vary with the seriousness of the attack. If caterpillars are large, and present in enormous numbers, a fairly heavy dressing is safer than a lighter one, and vice versa.

Tests by sprinkling measured areas gave the following results:—

	Lb. per acre dry weight of bran.
Very heavy broadcast dressing	220
Heavy broadcast dressing	180
Medium broadcast dressing	100
Light broadcast dressing	50
Very light broadcast dressing	30

As in all cases of insect control, the economic problems of cost of application, against gain by the protection offered, must be worked out in each individual case, by the person interested.

Biological.

The possibility of this form of control being used in the case of *Euxoa radians* has not been seriously considered. The pest is of sporadic occurrence, so that already it is controlled save when exceptional circumstances allow it to become of economic importance. It is indigenous and has numbers of native parasites operating against it, so that it does not appear to offer a good subject for biological control methods.

Entomophagous fungi have been used in other parts of the world to attempt control of cutworms, but so far little hope is held out of that method being a successful one.

Its habits protect it from natural enemies while at the same time placing it at the mercy of soil conditions. In poison baits there is a very good local form of control which is usually cheap enough in application to warrant its use.

[TO BE CONTINUED.]

"A WEALTH OF INFORMATION."

A Home Hill farmer writes (*4th October*, 1930) :—" . . . . *From the pages of the Journal a wealth of information is to be gleaned by the man on the land. I always look forward to its arrival.* . . ."

DISEASES OF THE PIG.*

E. J. SHELTON, H.D.A., Senior Instructor in Pig Raising.

[*Continued from the September issue.*]

PART II.

In the preparation of information dealing with Diseases of the Pig, an endeavour has been made to describe in the simplest language possible the various conditions, abnormal and otherwise, associated with the incidence or appearance of disease in swine. The suggested preventive measures and methods of treatment are such as may be successfully carried out by any careful farmer, excepting only in cases where the services of a qualified veterinarian are advised, and in these cases the best methods to follow will be suggested on the spot by the surgeon himself.

The pig is notoriously a bad patient and a difficult animal to handle when indisposed, hence great stress has been laid throughout this treatise on the necessity of preventive measures, for prevention is not only much better than cure, but is invariably less costly and a great deal more satisfactory.

In dealing with methods of treatment and the engagement of qualified aid, it has been realised there are numerous difficulties in the way, because Departmental officers or practising veterinarians are not always immediately available in town or country districts. Again, therefore, we stress that prevention is better than cure, and we might even qualify this further by adding prevention is more necessary than cure.

Mr. Shelton's bulletin, representing as it does much labour and the fruits of careful study and observation, is a welcome contribution to current pig literature.—EDITOR.

DISEASES AND PARASITES OF THE SKIN.

PIGS suffer from several skin diseases (and from infestation by a number of external parasites), all more or less serious in their nature and effect, and all likely to spread through a herd if the animals are neglected. Skin diseases and parasites cause considerable economic loss in the course of the year, both in checking the animal's growth and in affecting the appearance of the carcass, for as is well known the skin is not removed from the carcass (as it is in sheep and cattle) during the process of slaughtering and dressing.

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* The typescript and illustrations of the Farmers' Bulletin on Diseases of the Pig have been submitted to the Chief Inspector of Stock, Major A. H. Cory, M.R.C.V.S., Department of Agriculture and Stock, Brisbane, Queensland.

Copies of the Bulletin may be had gratis on application to the Under Secretary, Department of Agriculture and Stock, Brisbane, Queensland.

In the compilation of this paper the writings of recognised authorities in other States and other parts of the world have been drawn on, and the assistance thus received, also that freely given by other Departmental officers, is acknowledged gratefully.

Diseases and parasitic affections of special interest to pig breeders are—

Sunburn or Sunscald,
Urticaria or Nettlerash,
Pigmentation,
Pruritis or Itching of the Skin,
Dermatitis,
Eczema,
Hog Lice, Fleas, Flies, Mosquitoes, Scrub Ticks,
Demodectic or Sarcoptic Mange,
Open Wounds, and occasionally Snakebite.

DEEP SEATED PARASITES.

The parasites that burrow into the skin cause intense irritation and result in rapid loss of condition, and in some instances in an anaemia of the body. The skin is also damaged as a result of the animal rubbing against fence-posts and tree-stumps, and the commercial value of the carcass is reduced even though it may not be condemned as unfit for use; in such a condition the carcass lacks its characteristic colour and presents an unsightly appearance. In some cases the flesh is quite healthy and normal if the skin is removed, but the value of that particular carcass is reduced.

It is difficult for farmers to differentiate between the various skin diseases of the pig, for, in many respects, they resemble one another. Nettlerash, or mange, for instance, are deep seated troubles, whereas sunburn and sunscald are surface complaints, yet both cause severe reddening and soreness of the skin.

Effect of Disease.

The skin of the pig in health is very sensitive, both to internal and external influences. In disease, it may be discoloured, blotched, scarred, or disfigured in patches of varying size and shape, or it may be roughened and painful, yet not actually damaged. Such abnormal conditions may result from parasites, injuries, sunburn, or from accumulations of filth and mud. Internally, abnormal conditions may result from the improper use of certain foods; simple discoloration of the skin is seen even in slight digestive derangements and fevers, but these usually are not serious and yield to the administration of a brisk purgative, to suitable dieting, and to the discontinuance of the foods responsible for the trouble.

Dirt, lice, and mange mites produce an inflammation of the skin which is sometimes referred to as dermatitis. The latter differs from eczema in not passing through definite stages such as are common in that disease and by being produced principally by external causes. Lice, owing to their relatively large size, may readily be seen by the naked eye; mange mites, of which two varieties affect the pig, are minute and require the use of the magnifying glass in their discovery, and much more energetic and protracted treatment for their destruction. Pigs are occasionally affected with a non-parasitic skin disease referred to as sucking-pig rust, sooty or pitchy mange, a condition arising from dirty sties, accumulations of mud, and decomposition of the sebaceous matter of the skin—a trouble also exaggerated by internal ailments. Internal parasites also cause an unthrifty condition of the skin, and may be responsible for all the above skin troubles.

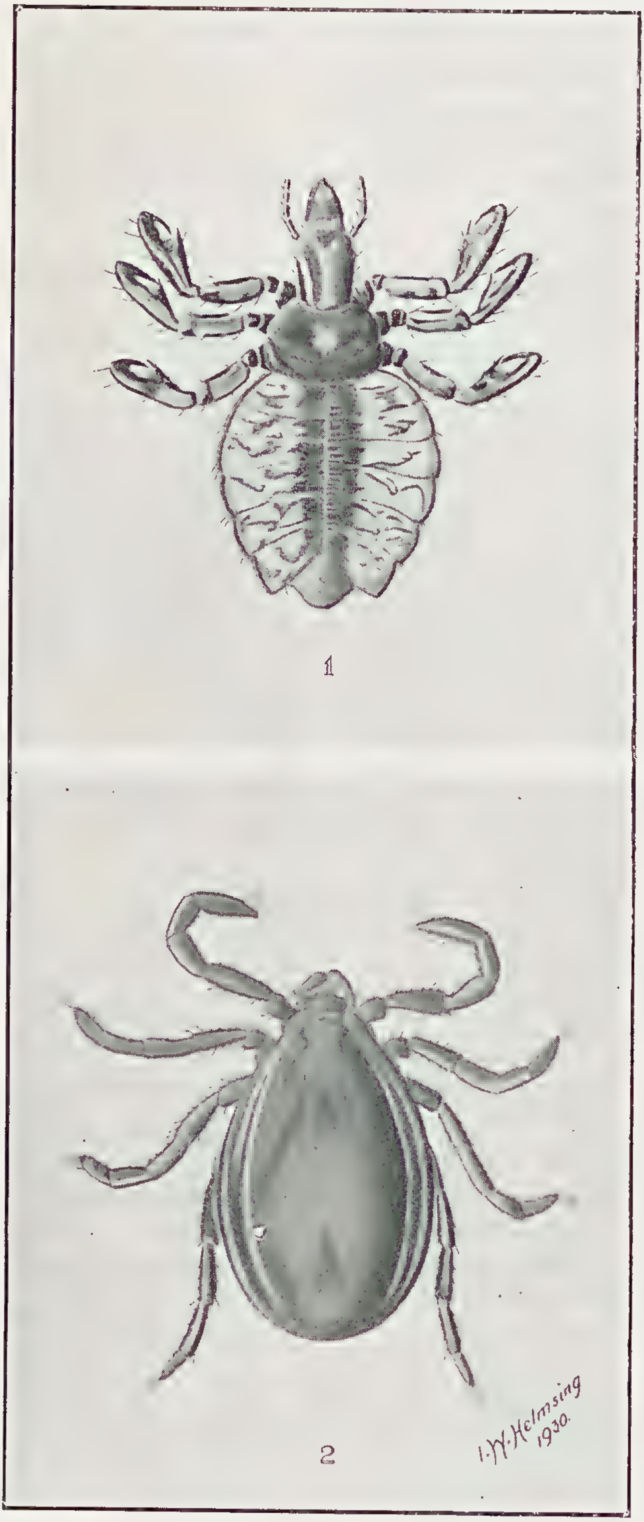


PLATE 135.
Fig. I.—Hog Louse × 10 (*Hæmatopinus suis*, Lin.).
Fig. II.—Scrub Tick × 10 (*Ixode holocylus*).

Pigs whose growth is checked by abnormal conditions (prenatal and otherwise) are usually styled "runts." It usually pays better to destroy the runts and to devote the time, attention, and food to more thrifty stock.

Meat inspectors often come across the carcasses of pigs in which the skin is blotched, freckled, or stained to such an extent as to cause the carcass to be graded as second or third class, or even unmarketable. These cases are usually classed as due to pigmentation. It is difficult to account for them, and in many instances actual cause is unknown; deep seated pigmentation in the region of the udders producing the condition known as "seedy cut" is responsible for economic losses in the bacon trade, particularly in the keener competition overseas.

Improper food may cause the carcass to be yellowish or pinkish, or to have a distinct fishy taint. Carcasses may also be soft and fail to set in cases where excess of oil is present in the food. Such carcasses are quite unsuitable for bacon, and are often of no value in the preparation of small goods. In the trade they are often referred to as "peanut-fed" pigs, though peanuts are not the only foods responsible.

ECZEMA.

True eczema is non-contagious and is an uncommon skin disease of the pig, the true form of which manifests itself by an eruption consisting of tiny reddened pimples, which later develop into blisters and pustules, which dry off and result in scab formation. These pimples may remain separated from one another or may run together and form large weeping sores which contain matter or pus, and may be the medium by which a septic condition of the skin may spread from one animal to another, as, in their endeavour to relieve irritation, the affected animals rub against fence-posts, rails, troughs, and trees.

Treatment.

For the relief of eczema, both internal and external medication is required. Commence the treatment by giving a brisk purge, followed by medicines that eliminate the waste products and toxins of the body, by way of the kidneys and the intestines.

Cleanse the skin with soap and warm water, and when dry rub in lightly a dressing of coconut or salad oil. Follow this by dressing the skin daily with 1 per cent. solution of picric acid, or with a mixture prepared as follows:—

Salicylic acid	2 drachms
Oxide of zinc	3 drachms
Coconut oil	8 ounces

Mix well and apply night and morning. Internally, medicines prepared as follows may be used:—

Recipe No. 1.—Bicarbonate of potash, 1 part; black antimony, 1 part; nitre, 1 part; sulphur, 3 parts; liquorice powder, 4 parts; fenugreek, 12 parts. The dose is from one to four teaspoonsful mixed with the food daily.

Recipe No. 2.—Another useful medicine which the local chemist would make up has its chief components: Potassium nitrate, ½ to 1 drachm; sodium bicarbonate, 1 to 2 drachms. Give as directed in food.

DEMODECTIC MANGE.

Demodectic mange is highly contagious, and is caused by a minute parasite called *Demodex folliculorum* var. *suis*. It differs from eczema in that it is caused by a parasite, wheras eczema is purely a constitutional trouble. It first shows in the form of blisters which later contain pus. The disease is most frequent in young, weakly, or sickly animals, and generally spreads over the whole body. It is exaggerated by dirty sties, accumulations of mud, and decomposition of the fatty secretions of the skin.

Treatment consists of washing the affected animal frequently with warm water and soft soap. The pigs must be kept under hygienic conditions and be given plenty of nourishing food. In very severe cases affected animals should be slaughtered without delay.

It is well to remember that mange parasites are not usually troublesome, except in cases where the animals are neglected and improperly nourished.

It must also be kept in mind that no treatment will prove efficient unless the buildings in which the stock are kept or housed are also thoroughly disinfected. The buildings should be sprayed with a solution of carbolic acid, 1 part to 300 parts of water, taking care to force the spray well into the crevices where the mange mites accumulate. The pig yards and paddocks should be thoroughly cleaned up; rubbish, corn cores, waste timber, bones, and other accumulations raked up and burnt, and the yards dug over and limed. If it can be arranged for, the pig paddocks should be ploughed and some green crop grown thereon for a season or two. Grass paddocks should be burned off and be put under cultivation before being brought into regular use again.

SARCOPTIC MANGE.

Another troublesome skin parasite, *Sarcoptic scabiei* var. *suis*, is responsible for the condition known as sarcoptic mange. Here again microscopic examination of the scurf would be necessary. The disease is first seen affecting the head, especially in the hollows of the eyes, on the eyelids, and around the ears, then over the neck, back, and inner sides of the thighs, and finally over the whole body. Early in the attack the disease will be noticed as roughened patches covered with bran-like scales, blisters, and pustules. Later these pustules develop into extensive whitish grey scabs. The skin becomes thickened,

PLATE 136.—EXTERNAL PARASITES IN SWINE.
Sarcoptic scab in the pig.

wrinkled, and very tough. The bristles are loosened and fall out—sometimes they become attached and fall out in bunches or tufts. Beneath these roughened patches will be found the tiny microscopic mites responsible for the trouble. The disease is not prevalent in Australia as far as departmental records show.

Treatment.

Preventive measures are emphasised. There are several forms of treatment, and several mixtures well worth applying early in the attack. First, aim at softening and removing the scabs with warm water and soft soap. It may be necessary to give the animal several washings before the desired results are obtained. Meanwhile the pigs should be kept in a dry sty, supplied with short straw or other clean dust-free bedding. The following lotion should be applied to the skin as soon as the scabs are softened and ready for removal:—Flowers of sulphur, 3 oz.; potassium carbonate, 1 oz.; neatsfoot oil, 1 pint; mixed together while the oil is warmed slightly. Pigs should be well washed before applying the mixture.

Mange, when present in a piggery, is liable to cause considerable economic loss, for the animals, in endeavouring to obtain relief from the intense irritation, rub themselves against all sorts of roughened objects, damaging the shoulders, sides, and hams more than the belly or feet. The loss is greater than if the head, ears, or neck were the principal or only portions affected.

This damage to the carcass by roughened skin and inflammation sometimes causes the meat to be rejected as unmarketable. In other instances the injuries place the products from such pigs in a grade which has a reduced market value of from 2d. to 3d. per lb.

Treatment for sucking-pig rust or pitchy mange referred to herein consists in cleanliness, correct methods of feeding, and frequent washing of the skin with soft soap and warm water, followed by application of oil or antiseptic ointment. The following mixture is recommended:—

Raw linseed oil	1 quart
Hycol disinfectant	1 teaspoonful
Flowers of sulphur	4 ounces

Mix the flowers of sulphur with a small quantity of the oil first, then add the balance of the oil, and finally add the Hycol disinfectant, stirring the latter well into the mixture before applying to the skin. Repeat the application for several days, and keep affected animals isolated from healthy stock and under improved hygienic conditions, feeding liberally on soft, nourishing foods, allowing ample supplies of clean drinking water, greenstuff, and mineral matters.

URTICARIA OR NETTLERASH.

This disease is of dietetic or systemic origin, and causes intense irritation and inflammation of the skin. It is usually noticed in very young pigs, and is frequently associated with disorders of the digestive system (indigestion, feverishness, diarrhœa). In its efforts to obtain relief the affected animal rubs itself vigorously against fence-posts, rails, and the pen walls, and is likely to seriously injure the skin, which then becomes more readily affected by mange, sunburn, and parasites.

Nettlerash of dietetic origin is often due to over-feeding on highly concentrated foods. Such disorders must be treated by regulation of diet and the provision of succulent green foods and ample clean drinking water. In many cases there are constitutional disturbances which lead to general ill-health.

Treatment.

In addition to change of diet, strict attention must be paid to cleanliness and to the general health and wellbeing of the animals. Frequent doses of Epsom salts, light nourishing food, and plenty of clean drinking water are advised. Softening the skin and hair by regular application of cocoanut oil or antiseptic ointments will assist considerably in effecting relief.

BLOW FLY WORRY.

The ordinary blow fly, usually referred to as the sheep blow fly, is a source of considerable annoyance to live stock. The damage and irritation resultant from infestation by the larvæ (maggots) of this fly is of considerable economic importance, though, as far as the pig raiser is concerned, the loss of his revenue should be reduced to nil, provided the stock are carefully handled and efficiently controlled.

In the pig, infestation by maggots follows the attach of the fly upon wounds resultant from castration or other operations or from accidental causes. The fly deposits the living larvæ upon the wounds and they set up irritation and pus formation. Unless the animal is given immediate attention this irritation may result in serious complications.

Treatment is largely preventive or such as would prove successful in dealing with wounds of any description.

[TO BE CONTINUED.]

RAKING A LAWN.

It is difficult to rake up leaves, grass, and hedge clippings from a lawn, especially when it is composed of baffalo grass. The contrivance illustrated will prevent the teeth of the rake catching in the grass. Two cotton-reels are placed one on each

end tooth of the rake, and wedged there so that the bottom end of each reel is a little below the line of the teeth. The rake then rides easily over the grass, and collects the rubbish.

FARMERS' SHEEP AND WOOL.

By J. CAREW, Senior Instructor in Sheep and Wool.

PART II.

This is the second article of a series planned for the purpose of supplying some of the information sought from time to time by readers interested in sheep and wool; and also with the hope of stimulating interest in sheep raising on comparatively small holdings.

BREEDS OF SHEEP.

BREEDS of sheep already known in Queensland may be classified in four groups, viz.:—The Merino; English Longwools; English Shortwools or Downs breeds; and the Intermediate or Corriedale.

The Merino.

The merino is by far the most important breed of sheep in Queensland. After experimenting with stock-breeding in the early days of settlement in Australia, Captain John Macarthur concluded that sheep would thrive better in this country than any other animal, and this belief has since been confirmed by experience and results.

His small foundation flock was composed of Spanish merinos brought in from Cape Colony and was improved by later importations from England, followed from time to time by different merino types (notably the Saxony and Negretti), but the real improvement was secured after the occupation of what proved to be natural sheep country west of the Great Dividing Range. The big-framed Rambouillet was subsequently introduced and this infusion, aided by science, good flock management, and change of environment, produced a long-stapled, bulky class of wool on a large-framed, strongly constituted type of sheep. In further development, a purely Australian breed was evolved containing three distinct types, viz.—fine, medium, and strong.

Each of these groups possesses its own peculiarities, and two are adapted especially to Queensland conditions—namely, the medium and strong types. Of these, the medium forms the greater proportion and ranges over a vast extent of our pastoral territory. In the far West where conditions are exacting and animals of the hardiest constitutions are required, the strong type is favoured.

The wool of the merino is short, of fine quality, even, regular in length, of distinct character and showing a well-defined crimp according to type.. In colour it is bright white, fairly well-charged with yolk which, in heavy condition, may show up as light brown. The breed is slow in maturing, but when bred and reared under congenial conditions retains its vitality to an old age.

The Longwools.

The Lincoln (Plate 139), like the Romney Marsh, was originally a Marsh breed, and, although it is now surpassed by the Romney in its ability to withstand wet conditions on low lands, it is generally considered to be hardier than either of the Leicester breeds. They cross well with the merino, and the half-bred ewes from this cross, when mated back to the merino, produce a greatly-favoured breeder for the fat-lamb trade. The Lincoln half-bred, and to a greater extent the quarter-bred, is also valuable, as a wool-producer, giving a fairly weighty fleece of good length and colour, improving in quality with the influence of the merino.

PLATE 137.—A GOOD TYPE OF AUSTRALIAN MERINO RAM.

PLATE 138.—MERINO EWES.

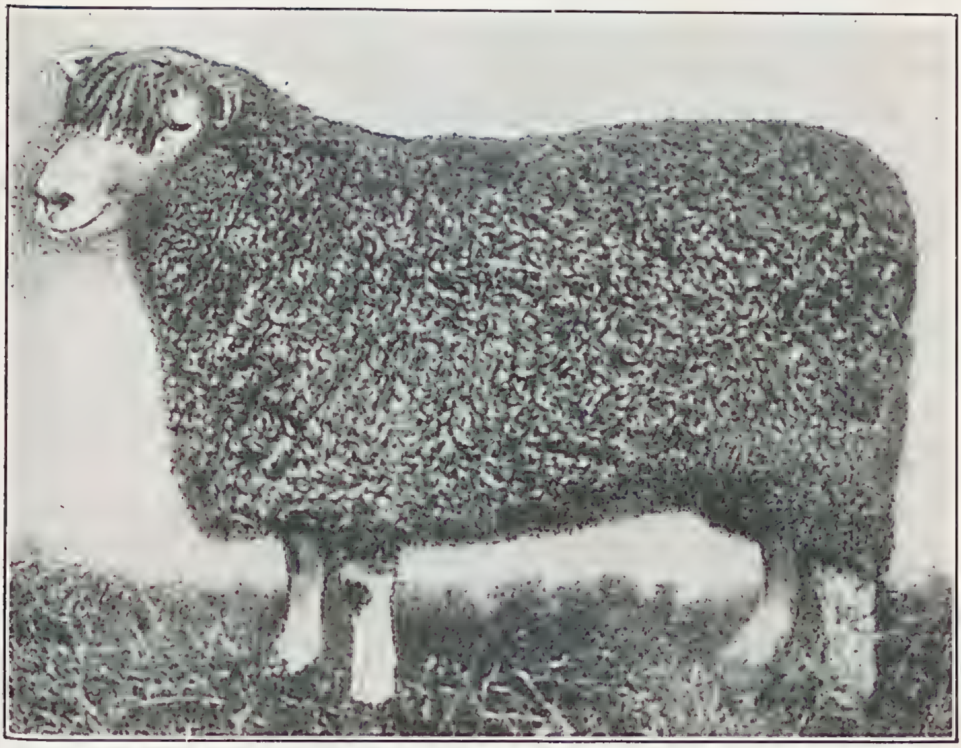


PLATE 139.—LINCOLN RAM.

PLATE 140.—LINCOLN-MERINO CROSS.

This breed has been most favoured since its descendants in countries other than England have proved of such value in crossing for both wool production and mutton. (Plate 140.) A peculiar fact is that the half-bred Lincoln merino matures earlier and fattens quicker and easier than either of its parents.

The English Leicester (Plate 141) is another of the longwool breeds. It is an outstanding example of what can be achieved in breeding by selection.

Robert Bakewell's name stands out prominently in connection with the improvement of the Leicester in transforming it, in a few years, from a raw-boned, lanky sheep to a model of symmetry that developed quicker, and put on flesh on the most valuable parts, with a minimum amount of bone. The new Leicester was best suited to favourable conditions, and stood badly with other breeds on scanty pastures. They are not so prolific as other breeds. These defects, together with delicacy of constitution and poor milk secretion, stand against the breed to this day. They cross well with almost any breed, particularly with the merino, but more favourable conditions are necessary than for other longwool breeds. The Leicester produces a lustrous wool about 8 to 9 inches long, with a spinning quality of about 40s. The fleece weight varies from 12 to 20 lb.

The Border Leicester (Plate 142) is also a longwool breed, though the wool is not so long as that of the English Leicester, but finer in quality, and lighter in fleece weight.

This breed is really the result of a cross between the English Leicester and the Cheviot. The former was selected for its flesh production and the latter for its ability to withstand hardship, the idea being to raise a special dual-purpose sheep. The results have been a good illustration of what can be accomplished by mating suitable breeds and making the right selections. Their forequarters are full and well formed, their ribs well sprung, showing a straight square back noted more for width than depth, which gives them a high standing appearance. This with their white well-carried head, commands attention.

Considering its large frame it matures very quickly and when crossed with the merino transmits the same quality to the offspring. (Plate 143.) The half-bred ewe makes a good mother, and is specially suited to mixed farming conditions, but is more partial to higher and sweeter country than either the half-bred Lincoln or the Romney Marsh, while as breeders they do not retain their stamina for the same length of time.

These half-breeds are suitable both for the fat lamb trade and mutton. The wool they produce is of a useful type, being about 56s., in spinning counts, usually showing plenty character, and of a good colour.

The Romney Marsh (Plate 144), although a longwool breed, cannot be regarded as up to the standard of the other breeds named as wool-producers, the wool being duller in colour, shorter and showing less character. They are more of a natural grass sheep than any of the longwools; their chief feature being a strong constitution, hardiness under wet trying conditions, and their adaptability to low-lying situations. In the North Island of New Zealand the Romney has become very prominent where formerly it was thought impossible to establish sheep breeding owing to the moist conditions, and it is owing to its influence that the export lamb trade in the North Island has become so firmly established. They cross well with the merino; the half-bred ewe can be regarded as a most useful farmer's sheep. (Plate 145.)

Other longwool breeds could be quoted, but there are no conditions in Queensland which could be met by any of these breeds better, or as well as, the breeds referred to. On account of the weight of fleece that these Longwools and their crosses produce, they are more profitable to keep as breeders for farmer's flocks than the Downs breeds or their crosses. When finished with as breeders there is a

PLATE 141.—THE ENGLISH LEICESTER.

PLATE 142.—THE BORDER LEICESTER.

PLATE 143.—BORDER LEICESTER-MERINO CROSS.

PLATE 144.—THE ROMNEY MARSH.

large carcass left for the butcher. All these points must be considered when undertaking sheep-breeding on small holdings, although the Downs breeds possess many good qualities. They are purely mutton sheep and quick maturers as lambs. As breeding ewes, however, have to be retained on holdings from year to year, the most profitable type should get preference, especially if they possess all other suitable characteristics. In breeding for the fat lamb trade, the Downs breeds are worthy of consideration.

The Downs Breeds.

The Southdown (Plate 146) is the oldest of the British Downs breeds, and has been regarded in England as producing the primest mutton. The body is uniform, broad, compact, having evenly-balanced joints, with flesh and fat evenly distributed. The lambs grow quickly and fatten easily. For our purpose they do not show sufficient merit to compensate for their lack in the production of wool. They may be used to advantage in mating with crossbred ewes for getting early-maturing lambs, but other breeds have been tried out in comparison with them and have proved more satisfactory in this respect. This with its low annual return for wool does not tend to increase its popularity as a farmers' sheep in Queensland.

The Shropshire is another of the dark-faced Downs breed. It is darker in the face and points and not so symmetrical in shape as the Southdown, but rather hardier and thrives better on a variety of pastures. In most respects, however, it is similar to the Southdown.

There are several other Downs breeds available as mutton breeds, including the Dorset Horn (Plate 147), which has proved itself one of the most suitable as a sheep giving a greater body weight and one of the earliest to mature, as also is its progeny when crossed with crossbred ewes. (Plate 148.) This is not only the result of experiments in Queensland, but also in New South Wales and South Australia.

The best results have been achieved when mating the pure Downs breeds with half-bred ewes. In following this system of mating the whole of the progeny can be disposed of as soon as fit.

The Corriedale.

Another sheep which has developed into great favour is the Corriedale. (Plate 149.) This breed was raised by crossing the Lincoln with the merino, and is now regarded as a type midway between the two breeds.

The evolution of this breed filled a vacancy in breeds required as dual-purpose sheep for farming conditions. Continually cross breeding for a given purpose does not give us anything permanently suited for the purpose, so that the Corriedale not only supplies us with sheep well fitted for farming purposes, but it gives us a lead in evolving other types, which may be necessary for other special purposes.

The Corriedale develops into a good, strong, large-framed, robust sheep which carries a fleece weight ranging from 10 to 12 lb. with spinning counts ranging from 54s. to 56s. and higher.

The breed is remarkable for the evenness of length and quality of the wool they produce. The staple should be long according to quality, bulky, full and even to the tip, showing a pronounced wave or crimp throughout. The lambs are not such quick-maturers as some of the crossbreds referred to previously, but this could not be expected when their wool-producing capacity is considered.

As a breed where wool and mutton are the chief considerations they stand out on their own as farmers' sheep in the Plateau area. The ewes (Plate 150) make ideal breeders for farmers' flocks, and are suitable as mothers for the fat lamb trade when mated with either the Border Leicester or Dorset Horn ram.

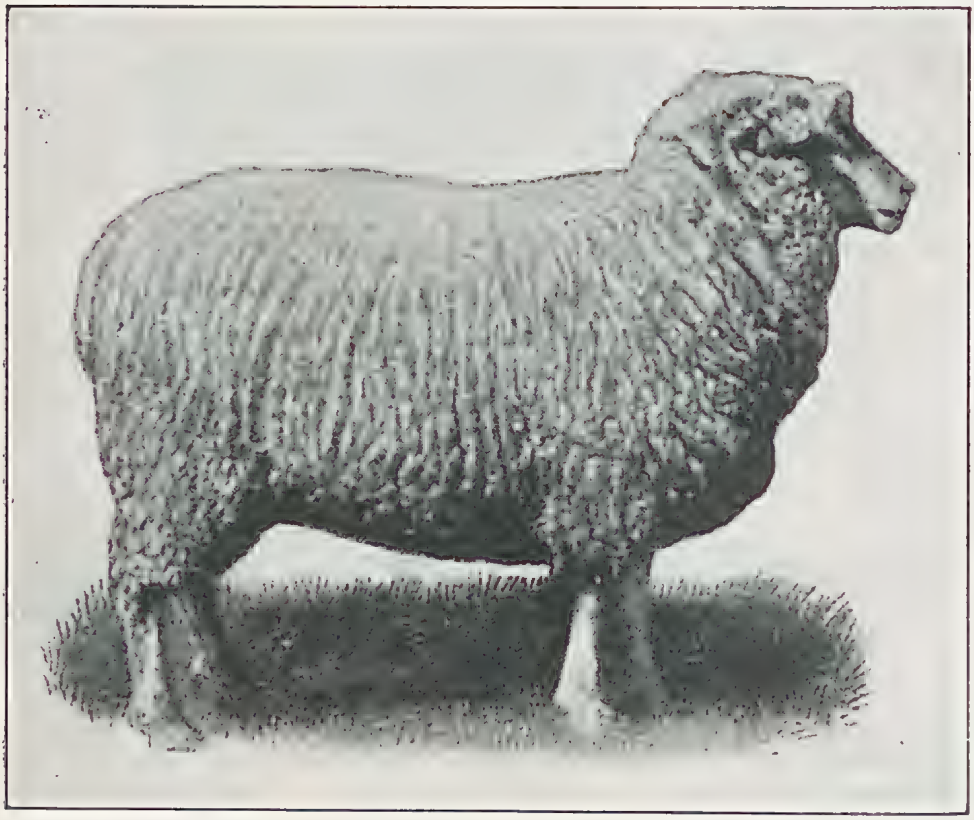


Plate 145.—Romney Marsh-Merino Cross.

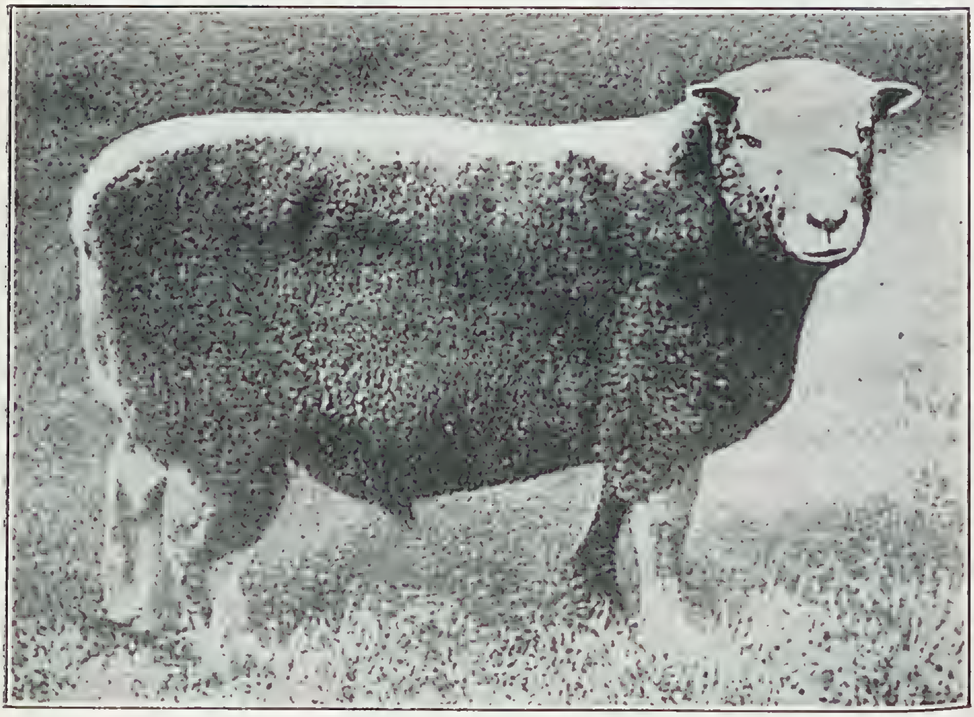


Plate 146.—The Southdown.

Plate 147.—The Dorset Horn.

Plate 148.—Dorset Horn-Crossbred Cross.

Plate 149.—The Corriedale.

Plate 150.—A Corriedale Ewe.

RECLAIMING PRICKLY-PEAR LAND.

PASTURE EXPERIMENTS AT PALARDO.

By H. C. QUODLING, Director of Agriculture.

The remarkable success of efforts to combat the prickly-pear by biological control methods, mainly by means of the moth Cactoblastis cactorum, the caterpillars of which feed voraciously on this plant, has created interest in the question as to how land reclaimed from the pest may be brought into economic production. Accordingly a series of experiments were begun last October on a 70-acre section of belah and brigalow country near Palardo, in the Maranoa district. Various grasses and fodder plants were sown. For the greater portion of the experimental term exceptionally favourable seasonal conditions prevailed. By May every kind of plant grown had made sufficiently good progress to warrant light stocking with sheep of the area sown. Extraordinarily prolific growth followed the heavy rains of late autumn, and much heavier stocking of both cattle and sheep would have been possible. It may therefore be assumed with some justification that, after the destruction of the timber by "frilling" and poisoning (sufficient shelter belts and groves, of course, being retained), and the sowing of suitable grasses and fodders, this land may, without an unduly heavy outlay, be brought readily into profitable use.

The practical application of this system to extensive tracts of pear country now in process of being freed from the pest should have a far-reaching effect on production, particularly in relation to animal husbandry.
—ED.

To date nothing in the history of settlement in the "pear belt" of Queensland is thought to be of greater importance than the work of the Cactoblastis insect in freeing country of the pest, which at its peak period overshadowed something like 50,000,000 acres of land. The necessity was realised of following up the progressive work of the insects, which have been widely distributed by the Prickly-pear Land Commission, and of finding a means of promptly bringing the immense areas of brigalow and belah "scrub" lands into a state of productivity. With this object in view, and setting aside for the time being the forest country (where grass and herbage soon show up after ringbarking) experiments were initiated last October at Palardo, on the Western line, where the use of a 70-acre section of country was secured from Messrs. Henderson Bros. Here, as in other places, successive waves of Cactoblastis had literally flattened out the pear and reduced it to a mass of rotted and partially rotted vegetable matter, right in amongst a thick stand of trees, numbering between 200 and 400 per acre, mostly about 8 to 10 inches in diameter, with odd trees, in the case of the belah, up to 20 inches at the butt.

Other objectives aimed at in designing the experiments were:—

(*a*) To try and derive the fullest possible benefit from the large quantity of vegetable matter present.

(*b*) To avoid the immediate use of fire so as to ensure the preservation of the humus; and the various forms of insect life which had wrought the destruction of the pear in the first place, so that successive generations of insects might more effectually deal with all the following growth of pear, and, incidentally, to obviate the inevitable suckering, which takes place if brigalow is prematurely fired.

(*c*) To "frill" and poison the standing timber with arsenic pentoxide to ensure a more rapid and decisive "kill."

(*d*) To broadcast summer-growing and winter-growing grass mixtures and cover crops to permit of stocking the country as quickly as possible and making it productive in a matter of months rather than years; and in doing so, to bring about an appreciable increase in its carrying capacity.

(*e*) To ascertain the most suitable and effective strength of arsenic pentoxide solution for timber destruction; and for killing "suckers."

(*f*) To determine the best period of the year to destroy the timber, so that any suckering of the brigalow would be avoided.

Plate 151.—An Outpost of Empire. The Pioneer Surveys a New Realm.
Typical Brigalow and Belah "Scrub" Country Interspaced with Box and Sandalwood Forest (overlooking Site of Experiment Plots).

Plate 152.—"Pear" Growing on Experimental Plot Site before the Introduction of Cochineal and Cactoblastis.

SUMMER SERIES.

In the summer series, Rhodes was chosen as the principal grass (8 lb. per acre); a small quantity (1 lb. per acre) of *Paspalum dilatatum* being added. Individual cover crops on the respective 3-acre sectional areas being Sudan grass (8 lb. per acre), White Panicum (20 lb. per acre), Japanese Millet (20 lb. per acre), French Millet (14 lb. per acre), and Giant Panicum, setaria (20 lb. per acre).

Method.

As it was out of season for timber destruction work, October to December (the usual period being from late February to July), a strong solution (30 per cent.) of arsenic pentoxide was used and applied immediately after "frilling," a fall of 2.57 inches of rain having induced a perceptible sap movement.

Seed was broadcasted by hand in the first week in December right on top of the rotting pear. At this time a few of the trees were still alive, but most were dead or dying. Sixty-five points of rain fell in November. A heavy storm, yielding 318 points, fell the first week in December. The resultant moisture induced a good germination of seed, but did not penetrate more than 3 inches of the pear mulch, the soil being still dry. In January 229 points were recorded. February was a dry, hot month, only 93 points being registered. Approximately 60 to 70 per cent. of the cover crops and young grass seedlings perished about the end of the month for want of moisture. The remainder, which had the benefit of a slight run-off from the pear, carried on until the March rains. At this period all the cover crops bore seed, which fell and germinated, only to be checked by frost in May and June. By this time Rhodes grass was well established, but the stand requires to be thickened up by natural and artificial reseeding.

Conclusions to date show that the factors which adversely affected the progress of this series of experiments were the lack of moisture in the soil and subsoil (which did not get a good soaking until May), accentuated by the heat wave in February at a time when an appreciable number of trees were not quite dead, contributory to which was the all too short a period between the time of "frilling" and poisoning the scrub trees and that of sowing the seed.

WINTER SERIES.

In this set of experiments there were six plots, each 3 acres in area.

The conditions in respect to the pear itself were practically the same as for the summer series, viz.:—The rotted and partly rotted mass ranged from 3 to 5 inches in thickness, with numerous clumps of old, dry, fibrous pear about 12 inches in height, rotting at the base, but which had not yet completely broken down and flattened out. Throughout some small patches of soil were to be noted where no pear had grown, these being found more in the belah, and were either lightly covered with short moss or with thin tufts of grass, *Panicum gracile* principally; a little creeping saltbush and roley-poley (*Anasacantha*) were also showing up at intervals.

The period of frilling and poisoning the trees, October to December last year, was practically the same as for the summer series. A few trees still showed signs of life on 10th February this year, when the seed was sown, but by 20th March, the date it germinated, the trees were to all intents and purposes dead.

Seed Mixture.

To provide for a well-balanced ration, a standard mixture was made up for this particular experiment, subsequent to testing the germinating quality of the seed, comprising—Prairie grass (10 lb. per acre), Lucerne (3 lb. per acre), Bokhara clover (2 lb. per acre), Rhodes grass (2 lb. per acre), Sheep's burnet (1 lb. per acre), and *Phalaris bulbosa,* Toowoomba canary grass (½ lb. per acre). This mixture was sown with different cover crops for each plot, these latter being Currawa wheat (30 lb. per acre), Cape and Skinless barley (15 lb. each per acre), Algerian and Sunrise oats (15 lb. each per acre), Rye (30 lb. per acre), Canary seed (10 lb. per acre), and Dwarf Essex rape (7 lb. per acre) respectively.

Germination of Seed and Plant Development.

The seed lay on the surface at the mercy of birds and animals for a little over a month, an exceptionally good germination taking place on 20th March after the rain had carried the seed on to the rather loose but moist vegetable matter present in the interstices of the dried-out pear residues.

PLATE 153.—THE EFFECTIVE WORK OF THE CACTOBLASTIS ON EXPERIMENT PLOT SITE.

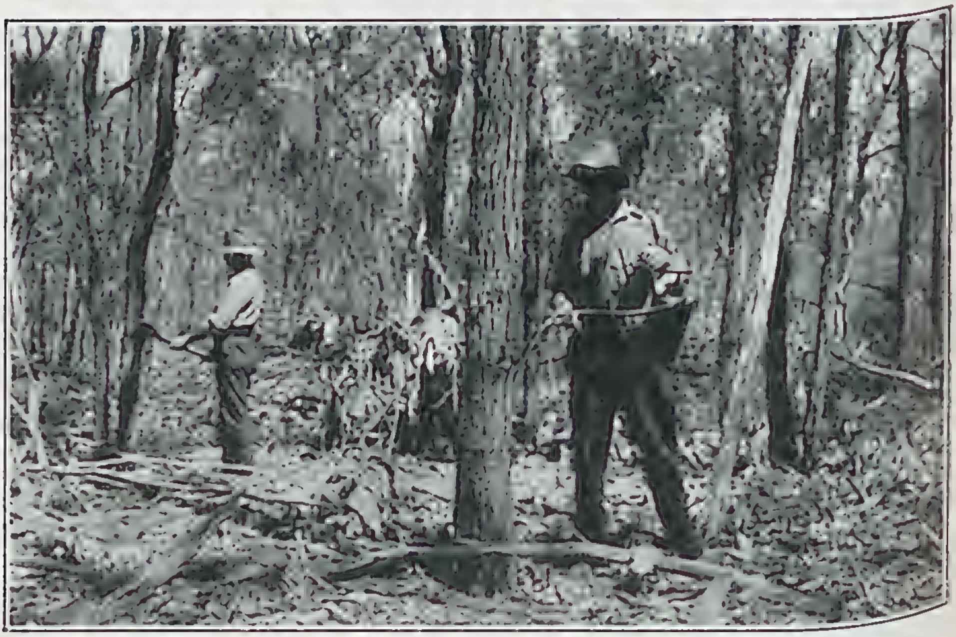


PLATE 154.—"FRILLING" AND POISONING TIMBER WITH ARSENIC PENTOXIDE. Cost 7s. 6d. per annum plus 1s. 6d. per annum for 6 lb. of poison.

Aided by an excellent season the growth was extraordinary, the taprooted plants—Lucerne, Bokhart clover, and Sheep's burnet—striking down through the decaying pear deeply into the soil, whilst all surface rooters revelled in the rich decaying vegetable matter.

Within three months there was an abundance of succulent fodder and grass in fit condition to carry stock. The lucerne and prairie by this time were 12 inches long, the cover crops being stronger and more luxuriant.

So far no stocking has been undertaken in connection with this particular series as it was necessary to allow the cover crops and grasses to mature sufficiently to permit of the yields being assessed, and to determine also whether certain of the plants would bear viable seed. The yield on the two most forward plots, where cover crops of rape and barley were grown, was taken on 9th July. The former gave a return of 14 tons of fodder to the acre and the latter 10 tons. The rainfall from January to June was as follows, the number of wet days being shown in parentheses:—January 2.29 (6), February .93 (3), March 1.89 (4), April 1.62 (3), May 5.29 (4), June 2.88 (7).

Conclusions.

The season undoubtedly was an exceptionally favourable one and much superior to the average run of seasons experienced in the district. Conditions were fairly normal prior to the heavy fall of rain in May. Observations then made showed that every kind of plant was making sufficiently good progress to warrant light stocking with sheep if it were necessary to do so. Aided, however, by the excellent rains in May, the resultant plant growth and development was extraordinary, which would have permitted fairly heavy stocking by cattle or sheep if such were expedient.

Up to the present there is some justification to assume that the frilling and poisoning of the "scrub" trees and the sowing subsequently of suitable grasses and fodders apparently offer an efficient method of dealing with this class of country. Its practical application to the extensive tracts of pear country now in process of clearing by biological means should have a far-reaching effect on production, which at a not too far distant date might be expected to find expression in the way of increases in the amount of beef, mutton and lamb, wool, dairy produce, and pork in direct proportion to the character of the development work undertaken and the kind and amount of food provided for the various kinds of stock.

PROGRESS REPORT, 1st JULY TO 30th SEPTEMBER, 1930.

Rainfall—Month.	Number of Wet Days.	Points.
July	3	91
August	4	141
September	5	87

Summer Series, 1929-30—(16 acres), comprising one 4-acre and three only 3-acre areas.

Reference was made in the June progress report to the fact that although a good germination occurred both of grass and cover crop seeds sown during the first week of December approximately 70 per cent. of the young plants died owing to the heat wave in February. Observation showed later that the time between the killing of the timber and that of sowing the seed (five to six weeks) was too short, as the subsoil had not been wet for several months and did not fully benefit in this respect until the following May. The cover crops, although they made fair growth, were patchy. The Rhodes grass was also irregular; it, however, made excellent progress, and except for slight tip frosting kept green and succulent right through the winter, the standing timber affording a certain protection.

As reseeding by natural means would not even up this stand of grass quickly enough to keep weeds in check, the several plots were resown (3rd to 6th September, 1930) with 5 lb. of Rhodes grass per acre and Sudan 8 lb., White Panicum, Japanese Millet, Liberty Millet, and French Millet 10 lb. per acre respectively.

Winter Series, 1930—Six plots, each 3 acres in area.

PLATE 155.—SOWING RHODES GRASS AND SEED OF COVER CROPS.

PLATE 156. COVER CROP OF WHEAT.

Seed sown, 9th February, 1930; Germinated, 20th March, 1930. Crop weighed, 29th August, 1930; Yield, 9·8 tons per acre.

Green fodder weights of cover crops used with the lucerne and grass mixture in this series (vide June report) were as follow:—

Cover Crop.	Date Sown.	Date Germinated.	Date Weighed.	Yield per Acre (Tons).
Wheat	9–2–30	20–3–30	29–8–30	9·8
Oats	10–2–30	20–3–30	29–8–30	14·4
Barley	10–2–30	20–3–30	9–7–30	10·0
Canary Seed	11–2–30	20–3–30	7–9–30	14·4
Rye	11–2–30	20–3–30	29–8–30	11·2
Dwarf Essex Rape	12–2–30	20–3–30	10–7–30	14·0

Photographs of several plots appear in the letterpress.

SUMMARY.

Conclusions drawn to date from this, the first winter series of experiments are, that the method of frilling and poisoning the timber and of sowing seed on top of the rotting pear, offered a practical means of making profitable use of this class of country quickly. It also demonstrated that, although the seeds and grain were variable in character, size, and weight, each kind germinated satisfactorily without covering of any kind, on a rough, uninviting surface; however, the latter's virtue and richness, like many things in nature, lay dormant immediately below it. Fairly heavy seeding was adopted as loss of seed and young plant life seemed inevitable.

Surface and tap-rooted plants were chosen to provide, as far as possible, for a balanced ration to fatten stock quickly; for drought resistance, also for permanent pasture plants which would persist after those of annual habit had served their purpose. Modification both in the quantity and variety of seed appears necessary, if only from the standpoint of cost.

Feeding Off.

Thirty-four acres comprising the first of the summer (16 acres) and winter (18 acres) series of experiments was stocked with cattle of mixed sexes, principally growers; those of fattening ages being limited in number.

Details of Stocking.

Date Put On.	Kind.	Number.	Date Removed.	Kind.	Number.	Remaining until 22nd October, the Date of Sale.
12–9–30	Cattle	58	29–9–30	Cattle	30	Cattle 51
12–9–30	Horses	4	29–9–30	Horses	4	Cattle 3 (House Cows)
17–9–30	Cattle	26				

Cattle were in fair to forward condition when stocking of plots commenced 12th September, 1930. Eighty-eight were drafted on 29th September and 51 (34 steers 2½ to 4 years and 17 heifers and cows 3 to 4 years) in more forward to half fat condition put back to fatten and to remain until 22nd October, the date fixed for a local cattle sale.

Preference was shown for the different grasses and cover crops in the following order:—*Phalaris bulbosa*, Prairie grass, and Lucerne were grazed right away; then Canary seed, oats, wheat, barley, rye, and lastly Dwarf Essex rape. The cattle naturally paid more attention to the crops than to the Rhodes grass. It was observed that the amount and variety of fodder available soon effected an improvement in their appearance and condition.

At the time the cattle were introduced the Rhodes grass in the summer series was well established, up to about 18 inches in height, and as a result of the protection afforded by the standing timber and the volunteer growth of "milk" thistles and herbage, it was still soft and succulent and unaffected to any notable degree by frost.

PLATE 157.—COVER CROP OF BARLEY (CAPE AND SKINLESS).
Seed sown, 10th February, 1930; Germinated, 20th March, 1930. Crop weighed, 9th July, 1930; Yield, 10 tons per acre.

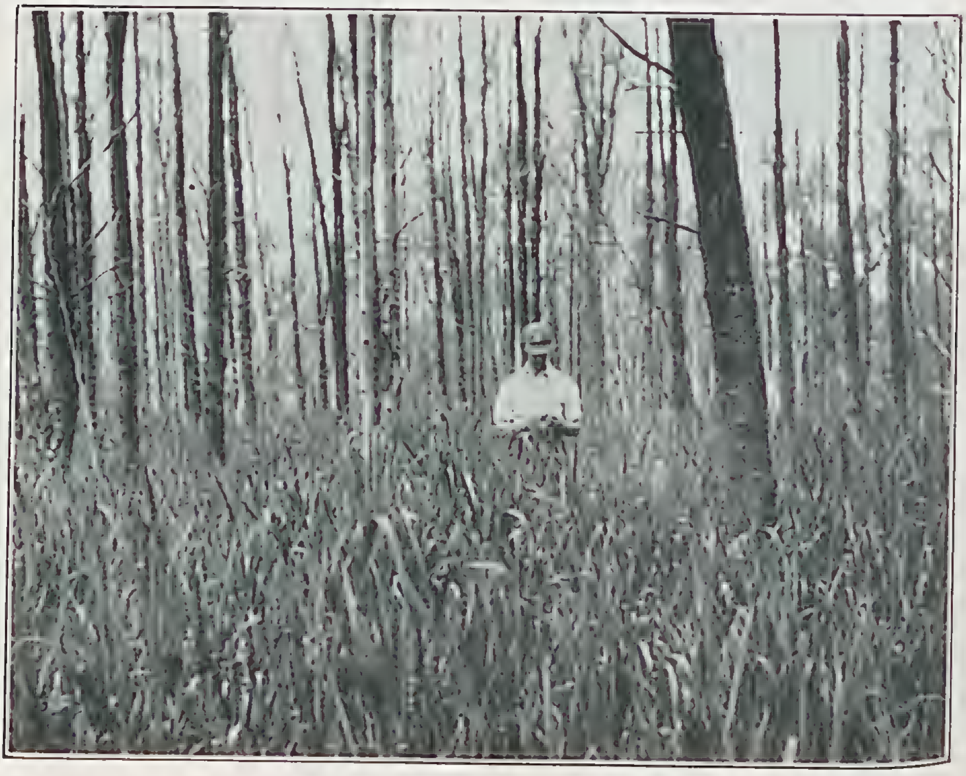


PLATE 158.—COVER CROP OF OATS.
Seed sown, 10th February, 1930; Germinated, 20th March, 1930. Crop weighed 29th August, 1930; Yield, 14·4 tons per acre.

Extension Work to Embrace the 1930-31 Season.

The original experiment area of 70 acres was increased to 134 acres, two seasons' operations being deemed necessary to provide for confirmation of present data, conditions on the new section being to all intents and purposes similar to those on the old.

Frilling and Poisoning of Timber.

This was done by contract on 64 acres at the rate of 7s. 6d. per acre. Work was commenced the second week in July and finished on 2nd August, a 20 per cent. solution of arsenic pentoxide was applied immediately the trees were frilled, by means of an atomiser (stainless steel); a short length of rubber hose (2 feet 6 inches), acorn nozzle and trigger control being substituted for the standard atomizer fitting. Six pounds of arsenic pentoxide per acre were used. Rhodamine B being added as a colouring agent to the poison, the cost of which latter was under a half-penny per gallon.

The sap was free, the soil and subsoil moist and the brigalow trees were in flower whilst the above work was in progress.

An excellent "kill" appears to have been obtained, the trees showing the effect of the poison within a few days of its application.

Half of this area is being reserved for the 1931 winter series of experiments.

Seeding Operations 1930-31 Summer Series.

Four plots, each approximately 8 acres in area were sown, 11th to 13th September, with the following mixtures, the seed being broadcast on top of the rotting pear to await sufficient rain to germinate it. Quantities per acre and price per lb. shown in parenthesis—

Rhodes grass (5 lb., 1s.); Sudan grass (8 lb., 5½d.); includes 3 acres Star Leaming maize (50 lb.).

Rhodes grass (5 lb., 1s.); White Panicum (10 lb., 6d.).

Rhodes grass (5 lb., 1s.); Japanese Millet (10 lb., 3d.).

Rhodes grass (5 lb., 1s.); Liberty Millet (Setaria) (10 lb., 3d.).

In order that comparison might be made between this latter section, seeded six weeks after the timber was poisoned; and another where the timber was poisoned last March, duplicate plots four in number, each 7 acres in area, were seeded 3rd to 6th September. Additionally 5½ acres were divided into three irregularly-sized plots and sown with Rhodes grass alone and Rhodes grass with cowpeas and Soya beans respectively.

Percentage Poisoning Tests.

Contiguous areas, thickly timbered, principally with brigalow, were chosen for this experiment, each approximately one-sixth acre in size, all conditions being comparable.

"Frilling and poisoning" was acrried out in March. The following percentages were used:—2½, 5, 7½, 10, 12½, 15, 17½, and 20. The weaker solutions did not appear to be as efficient as those ranging from 10 to 20 per cent. The "kill" effected by the 20 per cent. solution was, however, very decisive in character and was consequently adopted as the standard for all subsequent poisoning work and in this its efficiency was confirmed. The per cent. tests cannot be regarded yet as final.

Monthly Poisoning Tests.

In this series, sections each 1 acre in area were poisoned monthly throughout the year. In October and November there was a slight tendency of the brigalow to sucker from the main roots, at a short distance from the butts of the trees. The soil and subsoil at this period was more or less dry. These suckers, when several inches in length, were sprayed with an atomizer, a 20 per cent. solution of arsenic pentoxide being used. Three weeks afterwards they were rotten at the base. Except for the Sandalwood and Wilga, on which the effect of the poison was irregular, the trees generally were affected by the arsenic pentoxide within several days after its application. A regular count was maintained. Whip stick sized saplings, small Wilga and undergrowth were cut off close to the ground with a V-shaped cut and well sprayed, small bushes of *Cassia ovata* being similarly dealt with.

PLATE 159.—COVER CROP OF RYE.
Seed sown, 11th February 1930; Germinated, 20th March, 1930. Crop weighed, 29th August, 1930; Yield, 11·2 tons per acre.

PLATE 160.—COVER CROP OF CANARY SEED.
Seed sown, 11th February, 1930; Germinated, 20th March, 1930. Crop weighed, 7th September, 1930: Yield, 14·4 tons per acre.

Plate 161.—Cover Crop of Dwarf Essex Rape.
Seedsown, 12th February, 1930; Germinated, 20th March, 1930. Crop weighed, 10th July, 1930; Yield, 14 tons per acre.

Plate 162.—Feeding off the Plots.

Observation showed that the most important feature of any poisoning work is to carry it out almost simultaneously with the axe cut. Efficient axe work is also necessary; an "open frill" is desirable and should be made with a series of clean, sharp axe cuts, a wrench of the wrist being given as each chop is delivered, to free the outside of the sap wood and bark from the tree.

In this district the most promising period for timber destruction appears to be from late February to July. When the soil is moist and the sap is quite free, it may be extended into August, particularly in the case of late flowering trees.

Other Poisoning Work.

Boring ¾-inch auger holes close to the ground in the butts of a limited number of brigalow trees and filling them with "poison" was tried, but the only effect was to kill a narrow strip of bark, about 2 inches in width up the trunks of the trees.

A similar test was carried out with trees that had suckered after being frilled and poisoned, by boring directly into a main lateral root, at its junction with the trunk of the tree. This was equally as ineffective. There is no merit in either process.

Poisoning Box Trees.

Early in August the following tests were initiated:—Ringbarking alone (10-inch band); ringbarking and immediately spraying the sap wood with an atomizer, using a 20 per cent. solution of arsenic pentoxide; ringbarking and frilling combined; ringbarking, frilling, and poisoning; cutting box saplings down close to the ground with a V-shaped cut and spraying the cut surfaces with poison. Time is required to complete the tests.

Acknowledgments.

This department's thanks are tendered to Mr. J. B. Henderson, O.B.E., F.I.C., for the excellent photographs used to illustrate this progress report; also to the members of the Prickly Pear Land Commission for supplying, free of charge, all the arsenic pentoxide used in the experiments.

CARE OF THE CAR.

Springs make riding in a road vehicle at high speed possible; without springs the motor car would shake itself and the passengers to pieces within a very short time. Three types of springs are found in most cars to insulate the passengers from the shocks caused by the car striking bumps in the roads. These springs are the resilient tyres, the main springs, and the springs in the upholstery.

The Tyres.

The pneumatic tyre is an excellent form of spring, and performs the very vital function of eliminating almost entirely the quick, short vibrations that otherwise cause the whole car to vibrate. The old high-pressure tyres performed this function in part, but the modern balloon tyre does the job very thoroughly indeed. For example, it is possible to drive over a road the surface of which is loose gravel, and to feel not the slightest tremor within the car.

Not only must the springing be considered as a means of protecting the passengers, but also as a means of protecting the car. The wheels and axles are protected by the tyres only, and, therefore, are referred to as unsprung weight. While on the subject of tyres it might be well to mention the marvellous progress that has been made towards perfecting the tyre in the last few years. High-pressure tyres have been superseded by ballon tyres, and the 1930 tyre is less liable to blow out, and wears longer than any of its predecessors. The latest reports from abroad indicate that in a little time decorated tyres coloured to harmonise with the body of the car will be on the Australian market. No doubt the lady motorists of the near future will select the footwear of their motor cars and be influenced in doing so by the prevailing fashions.

The Main Springs.

The casual observer of progress in motoring would probably give most credit for the excellence of the modern car to its excellent engine. The writer is of the opinion, however, that the outstanding feature of the modern car is its comfort and stability on the road. Comfort and stability are essentially matters of spring design and distribution of the weight of the car. Springs on modern cars vary considerably in their design. The transverse spring, as its name implies, is one that is fixed across the car. The "Ford" is the best known car containing this type of springing. It has the virtue of being a cheap, simple construction, which gives good springing and excellent road holding to the car.

The full elliptic spring is one that is like a complete ellipse. This type of spring is unusual on modern cars, but is commonly seen on horse-drawn vehicles. The construction is expensive, and although the springing is excellent, good results are obtained from simpler systems. The "Franklin" car still retains this rather elaborate system of springing, and is renowned for its comfort.

The semi-elliptic spring is the usual type used on motor vehicles. In this type of spring the axle is clamped to the centre of a bow-shaped spring, either end of which is fastened to the frame. It is usual for one end to be fixed and the other end to be fastened through a shackle link. This loose coupling of one end is essential since the spring straightens out and therefore lengthens when a bump is taken.

The quarter elliptic spring is probably the simplest type of main spring found on the car. One end of this type of spring is clamped to the frame of the car, and the other end to the axles. No shackles are needed since both ends are rigidly clamped. This type of spring has been intensively used in England, and if it is correctly designed, it gives excellent results, although there is a tendency among car manufacturers to discontinue the use of this spring.

The cantilever spring is only found on the rear axle of some cars, and as its name implies, works on the principle of a cantilever. The spring is really a semi-elliptic spring used upside down. The axle is fastened to the back end. The middle is fastened to the frame of the car through a bearing, and the front end is also fastened to the frame of the car. The "Rolls Royce" car and other high-grade machines use this type of spring.

It is the aim of all designers of motor cars to reduce the unsprung weight in the car. In almost all cars the tyres, wheels, and axles are unsprung weight, and also the portion of the spring that is fastened to the axle. With semi-elliptic springs the heaviest portion is fastened to the axle, whereas with cantilever the lightest portion is fastened to the axle. However, this advantage is offset by the fact that some form of torque tube or stays must be provided to prevent the axle from twisting under the influence of the driving force, and thus the unsprung weight is augmented.

The quarter elliptic spring has little unsprung weight, but because of its design, allowance must be made for the front axle moving forwards and the rear axle backwards when the springs are depressed.

Many drivers neglect the springs and the shackle bearings of their cars for months at a time, although they see to it that the engine is well oiled. These drivers must fail to realise the amount of working done by the springs and shackles. It is only necessary to drive behind or beside another car that is passing over a reasonably rough road to notice the tremendous work done by the springs. The wheels are constantly shooting up and down, while the body moves along comparatively steadily.

The ordinary spring consists of several leaves of high-grade steel. These leaves slide over one another when the spring is flexed. The spring should always be kept oiled, so that this sliding motion is not hampered by friction. A dry spring not only wears, but also produces an unpleasant squeaking noise.

Some drivers believe in keeping the springs dry, so as to make them act as shock absorbers. This is a foolish policy, for if shock absorbers are desired they should be fitted rather than an attempt made to force the spring into a service for which it was never intended.

Most modern shackle bolts require oil or grease, which should be injected regularly. There are, however, a number of rubber and fabric shackles in use to-day which do not require greasing. Mention was made at the beginning of this article of the springs in the upholstery. These springs do not concern the motorist very much until the covering of the cushions is worn through; the spiral springs of the seats are then likely to have a disastrous effect on the clothing of those who sit upon them.—"Radiator," in the "Farmer and Settler."

AUSTRALIAN TRADE WITH THE EAST—I.

By Colonel D. E. EVANS, D.S.O., M.I.E.S., M.I.M.E.

The following notes by Colonel Evans, who is well known in Brisbane commercial and professional circles, were made in the course of a recent visit to Japan, Korea, Manchuria, and China, and will be read with much interest by all concerned with the expansion of Australian trade with the East, especially in relation to our primary products.

THE impression formed on my recent visit to the East was that Australia could get further trade. Japan has no great potential wealth other than the industry of her people. Manufacture is carried out mainly from imported raw material (other than silk) and the finished article is exported. It is on the wealth of Japan's labour that they have to depend, most foodstuffs being bought from outside. Korea supplies a good deal of these, but large importations of rice and other foodstuffs are made from outside countries. While being shown over the Yokohama Earthquake Memorial Museum, the Mayor brought under notice a chart showing assistance given in relief, and pointed out that Australia, on a population basis, gave more relief than any other country. Samples of the relief goods were on view, including Australian canned beef and condensed milk. It was remarked by a Japanese that it was a pity these brands were not available in Japan at present, because the people would like to trade with Australia. Tinned foods receive a ready sale in Japan, but the origin is generally America.

Hardwood.

Japan has little or no cheap hardwood timber, and softwood timbers are being used for sleepers on the railways. It would appear that a good hardwood timber business could be worked up in this country. This also applies to China and Manchuria.

Primary Products.

Manufactures from Australia generally have little chance in competition with the cheap labour of the East, except where the primary product can be favourably produced in Australia. For instance, Australia has a big export to the East of flour, butter, and meat, which are very favourably received. Japan takes our wheat and manufactures her own flour, but Southern China, Dutch East Indies, Malay States import our flour direct.

Beautiful fruit is grown in North China and Japan, and is plentiful, but as we have the opposite seasons a fruit trade there is possible.

Australian fruit is beginning to find a market in Java, and if proper care in selection and shipping is exercised I predict a steady increase in trade.

Queensland hams and bacon are favourably received in the East, but we should be able to get more of the trade.

The Eastern races are fast acquiring Western ideas in dress, customs, and foods, and it is mainly the latter that presents the greatest opportunity to Australia.

Owing to the prevalence of disease in the East, and the insanitary method of growing vegetables, it is not safe to eat vegetables that are not cooked. From Hongkong north this trade is supplied from America. Australia is in a good position to supply these needs, and a ready trade is available to countries north of Australia, while good shipping facilities exist between here and Singapore.

With the wide climate variations that exist from North Queensland to Tasmania, we can grow practically all the requirements of our northern neighbours, and our seasonable products are marketable in North China and Japan at a time when there is no competition, except where costly cold storage is necessary to market goods out of season.

It is not necessary to mention wool (Japan is already one of Australia's largest buyers), but only to say, when China becomes peaceful and settles down, I predict she will be a big buyer, as the many millions in North China, with their severe winters, are sadly in need of warm clothing.

Plate 163.—Primitive Transport in Manchuria. The Famous One-Wheel Cart utilising the Sail.

Plate 164.—Country Folk in Manchuria Enjoy an Outing.

PLATE 165.—AGRICULTURAL EXPERIMENT STATION AT KUNGCHULING, SOUTH MANCHURIA.

PLATE 166.—EXPERIMENTAL KOALIANG PLANTATION AT KUNGCHULING.

Manafactures—Labour Conditions.

Speaking of manufactured articles generally, I see little chance of capturing trade in the East.

Information on labour conditions may be of interest. In Japan the average wage of male labour is about 3s. a day; child labour to women workers range from 4d. to 2s., working in most cases ten to twelve hours a day, and in the various industries can be considered good labour, although in heavy manual work would not be as good as Australian labour working for commercial firms. In Korea and Manchuria and China generally, good male labour is available for 1s. 6d. a day; child and female labour 4d. to 1s. a day, working twelve hours a day. In Shanghai children eight to ten years of age working in textile factories often walk 6 miles to work, making 12 miles walking and twelve hours working. A Chinese engineer in charge of a large textile factory employing 4,500 people informed me that his heart went out to these poor Chinese girls, who, working under the conditions stated, would sometimes fall asleep at their work and be discharged. Under conditions such as these the Australian manufacturer has little chance in competition.

In Korea and Manchuria, where they have large concessions, the Japanese have not been able to absorb their over-population, mainly because Chinese labour is cheaper, and the Japanese, having a higher standard of living, are unable to compete.

PLATE 167.—A BROAD RICE FIELD IN MANCHURIA.

Trade.

Conditions generally in the East, with the exception of Dutch East Indies, are depressed. Japan, since the war with Russia, has made wonderful progress in industry, and during the Great War built up organisations in industries which were kept going to full capacity until a few years ago. These industries absorbed the large increased population, but with the world-wide depression many of the large industries are only working at half usual capacity, consequently much unemployment now exists in Japan.

China is in such an unsettled state with civil war—the armies mainly living on the industry of the people—that there is no stability of trade outside British territory and international concessions. Payments from the Government are delayed, and there is a general lack of confidence.

Singapore, Malay States, and neighbouring countries depending largely on tin and rubber, are feeling very much the drop in prices; but, unlike our position with wool, the prices obtaining will still allow the industry to be profitably continued in most cases.

In all these places the very prosperous times enjoyed for several years are reflected in the great improvements in private and public services. Beautiful and substantial buildings have been erected, and roads, harbour improvements, &c., give indication of money in plenty; but the general opinion now is that their products have reached the lowest values, and that in future conditions will be more stable.

[TO BE CONTINUED.]

OBITUARY.

ALBERT H. BENSON.

Queensland horticulturists, as well as those engaged in other branches of rural industry, lost a good friend in the late Albert H. Benson, M.R.A.C., who died in Brisbane on 16th October. Formerly Director of Fruit Culture in the Department of Agriculture and Stock, Mr. Benson retired from official life under the age limit provisions of the public service in March, 1927. Since then he had been associated in active partnership with his son, Mr. Harry Benson, in banana-growing and dairying at Kandanga and Brooloo.

The late Mr. Benson was the only son of the late Joseph Benson, a pioneer Queensland squatter in the Burnett district during the fifty's of last century. He was born near Taunton, in Somersetshire, England, on his father's estate, and was educated at Taunton College and the Royal Agricultural College, Cirencester, of which he was a member and gold medallist. He had been connected with agriculture during the whole of his life, and was a recognised authority on fruit culture. Shortly after he was twenty-one Mr. Benson was given the management of an agricultural estate is East Lothian, Haddingtonshire, Scotland, a county noted for its good farming. There he gained experience in growing various farm crops and breeding and fattening sheep and cattle, as well as raising fat lambs for the English market. He occupied that position for five years, when his employer, having accepted the Governorship of Madras, decided to let all the farms that had been under his management. Having heard a very glowing account of the prospects for successful culture of fruit in California, Mr. Benson decided to go to that country, where he remained five years, and gained practical experience in all branches of the fruit industry as well as a general insight into American methods of agricultural investigation and experiment station work, besides taking a course of training at the University of California.

Mr. Benson left California for Sydney early in 1892, and was offered the position of fruit expert to the New South Wales Department of Agriculture, and was the first person in the Commonwealth to be given that title. His work was not confined solely to fruit matters, but the knowledge he had gained of American agricultural and horticultural experiment work was made use of in the establishment of the Wagga, Bathurst, Pera Bore, and Wollonbar experiment farms. The value of his work was appreciated very highly by the then Premier of the Mother State (the late Right Hon. Sir George Reid) and Minister for Agriculture (Mr. Sydney Smith).

In 1896 Mr. Benson was offered the position of instructor in fruit culture for Queensland by the late Colonel A. J. Thynne, then Minister for Agriculture. His services in this State also were not confined to the fruit industry, but included general agriculture as well. Much of his instruction in fruit culture was of a practical nature, given in the orchard itself, and included cultivation, manuring, pruning, pest destruction, and handling and packing fruit for market.

Early in 1908 Mr. Benson was sent to England as a representative of his department at the Franco-British Exhibition, and was absent for twelve months. On his return he visited Ceylon and the Federated Malay States to obtain information in connection with tropical agriculture, and pineapple

canning in particular. He resumed his duties as instructor in fruit culture early in 1909, but resigned his position at the end of March, 1910, to take up that of Director of Agriculture in Tasmania. Here his early training proved of great value, as his duties necessitated having a good general knowledge of agriculture, stock, and fruitgrowing.

In 1915 Mr. Benson returned to Queensland as Director of Fruit Culture, which position he held until his retirement.

Plate 168.—The Late Mr. A. H. Benson, M.R.A.C.

On many occasions Mr. Benson acted as judge at the Royal National Shows, and he was also an honorary council steward of the association. The deceased gentleman is survived by his widow and one daughter (Mrs. E. A. Ferguson, Norman Park) and a son (Mr. Henry Benson, of Mount Kenilworth, Brooloo).

SEED MAIZE IMPROVEMENT.

By C. J. McKEON, Instructor in Agriculture.

The high quality of Queensland-grown grain is commended generally, and the standards reached are the results of many years of steady effort by Departmental plant breeders. In these notes, abstracted from the Annual Report of the Department of Agriculture and Stock, Mr. McKeon reviews the work of the past year in maize improvement.

WEATHER conditions in the early months of the maize-planting season were not generally favourable, with the result that the early crops as a whole were light. The rainfall, more especially in some of the more inland districts, was very scattered, and it was not possible for a general planting to be made. These conditions prevailed until late in November and early December, and consequently many of the crops were either light or practically failures for grain purposes. Good general rains, however, fell throughout the maize-growing districts during December, and conditions from then on were very favourable, with the result that the late-sown crop will be a good one generally.

The prices received for this season's maize were very good, considering the quantity of late market deliveries.

Although a fairly large area was again planted on the Atherton Tableland, the yield will not be heavy owing to abnormal conditions during the early part of the season. In January and February over 40 inches of rain fell, and as a result rust appeared in many of the crops. Fortunately, weather conditions improved, otherwise many of the crops would have very light.

Propagation Plots.

Propagation and stud plots were established in the Kingaroy, Mary Valley, Kilcoy, and Boonah districts. These comprised approximately 120 acres, the following varieties being used:—Improved Yellow Dent, Golden Beauty, Star Leaming, Reid's Yellow Dent, and Funk's 90-Dday.

The fertiliser trials with Star Leaming, carried out at Kingaroy the previous season, were continued this season on the same farm.

Results as a whole were very good, and some very fine yields were obtained; and although some of the early crops suffered from dry weather during tasselling, none was a failure. Weather conditions were very much favourable for the mid-season and late varieties, in fact the yields in some instances being reduced through too much rain. Good supplies of seed have been secured from the crops harvested, the quality being excellent. Several crops of Golden Beauty and Improved Yellow Dent have yet to be harvested, and further supplies of very good seed will be available, particularly from the plots of Golden Beauty.

Funk's 90-Day.

Four plots of this variety were sown, and one was not used for seed selection owing to the fact that weevils attacked the grain in the field, and by the time the crop was harvested the ears were too badly damaged to be used for seed purposes. Two of the crops gave very good yields, particularly one at Imbil. The actual yield could not be secured owing to the limited barn space not permitting of the whole of the crop being kept separate after the seed selection work was completed, but from what was threshed the computed yield was 90 bushels per acre. This crop created extraordinary interest amongst local farmers, and quite a number expressed their intention to grow this variety next season. The type and quality of the seed selected fro mthis crop were excellent, and it is pleasing to note that the reddish-tinted grains, so much in evidence when this variety was first introduced by the Department are fast being eliminated. Field characteristics have also shown a very decided improvement, the husk covering throughout the whole of these crops this season being particularly good. An ear to row test of this variety was sown, but was very badly damaged by hail when the plants were well above ground, and the stand was too irregular to be used for making comparisons of yield.

Star Leaming.

Results from these plots were on the whole very good, two of the five yielding particularly well, whilst very fair yields were obtained from the remaining three. An ear to row test plot was carried out at Kilcoy, the yields from which are shown later. In this plot the germination was very irregular, many of the rows being very thin. The uneven germination was caused through unfavourable weather conditions at the time of planting. Although good soil moisture was present and the drills were covered as quickly as possible, a considerable amount of this was lost in opening up for planting, the weather conditions being hot and dry and remaining so for some time afterwards. The propagation plot which surrounded the ear to row test plot was sown with a maize planter, and a very fine germination resulted. The type throughout the whole of the plots was particularly even, and the quality of the seed selected was splendid. This variety was again used in the fertiliser trials which were condusted on the same farm at Kilcoy as that on which the previous trials were carried out. In this season's trials the paddock was divided up into 144 plots, each measuring $\frac{1}{100}$th of an acre, eleven different mixtures being used, and the plots being randomised; each mixture was replicated twelve times, the remaining twelve plots being unmanured and used as controls.

The land received a thorough preparation, and was in very fine order at the time of planting, with a fair amount of moisture present. Weather conditions for some weeks after planting were particularly hot and dry, and a considerable number of the young plants were burnt off before good rain fell. The stand was therefore thinner than was desired, but this was uniform throughout and did not materially affect the results for comparison purposes. Weather conditions, however, improved when the plants were 1 foot high, and favourable conditions were experienced during the remainder of the growing period. During growth no difference was noticeable in any of the plants. The particulars of the yields of the various plots which are given are only tentative, as the final figures and conclusions will be arrived at by the Agricultural Chemist.

The following mixtures were used; the quantities shown being the rate per acre:—

Series marked N—100 lb. sulphate of ammonia.

Series marked ½ Ps—75 lb. superphosphate.

Series marked Ps—150 lb. superphosphate.

Series marked K—100 lb. potassium sulphate.

Series marked NPs—100 lb. sulphate of ammonia, 150 lb. superphosphate.

Series marked NK—100 lb. sulphate of ammonia, 100 lb. potassium sulphate.

Series marked NPsK—100 lb. sulphate of ammonia, 150 lb. superphosphate, 100 lb. potassium sulphate.

Series marked PsK—150 lb. superphosphate, 100 lb. potassium sulphate.

Series marked NPnK—100 lb. sulphate of ammonia, 150 lb. Nauru, 100 lb. potassium sulphate.

Series marked Pn—150 lb. Nauru.

Series markedS—50 lb. flowers of sulphur.

Series marked O—Unfertilised.

Average yield per acre of 12 plots of N series—42.9 bushels.

Average yield per acre of 12 plots of ½ Ps series—43.9 bushels.

Average yield per acre of 12 plots of Ps series—45.1 bushels.

Average yield per acre of 12 plots of K series—43.7 bushels.

Average yield per acre of 12 plots of NPs series—47 bushels.

Average yield per acre of 12 plots of NK series—42.6 bushels.

Average yield per acre of 12 plots of NPsK series—46.1 bushels.

Average yield per acre of 12 plots of PsK series—47.3 bushels.

Average yield per acre of 12 plots of NPnK series—45.7 bushels.

Average yield per acre of 12 plots of PN series—44.5 bushels.

Average yield per acre of 12 plots of S series—43.9 bushels.

Average yield per acre of 12 plots of O series—42.5 bushels.

The highest average yield was obtained from the plots treated with the PsK mixture—viz., 47.3 bushels per acre. Average yield from controls was 42.5 bushels per acre. The cost per acre of the PsK mixture was £1 15s.

Star Leaming.

EAR TO ROW TEST.

Row No.	Yield per Acre. Bushels.
403 x 191	32.9
403 x 192	57.1
403 x 193	38.0
403 x 194	30.7
403 x 195	43.2
403 x 196	53.4
403 x 197	33.6
403 x 198	39.5
403 x 199	57.1
403 x 200	54.9
Check	42.4
403 x 201	46.1
403 x 202	50.5
403 x 203	54.9
403 x 204	46.1
403 x 205	60.0
403 x 206	54.9
403 x 207	58.5
403 x 208	55.6
403 x 209	60.0
403 x 210	46.1

Note.—Rows 403 x 191 to 403 x 200, also the check row, did not germinate as well as the balance of the plot.

Reid's Yellow Dent.

Two plots, one of 10 acres and the other of 7 acres, were planted, and the results were very disappointing. The former plot made wonderful growth and yielded very well, but unfortunately this could not be used for seed purposes owing to a crop of another variety being sown alongside at practically the same time. The other plot was sown early, and consequently had to contend with dry weather until after the tasselling was finished, and the crop was naturally a light one. Sufficient seed, however, was secured for further plot work.

Golden Beauty.

All plots sown with this variety did very well, one crop in particular being outstanding in every way. None of these has yet been harvested, but the yield and quality will be excellent. The field characteristics as usual were wonderfully good, particularly the husk covering and the direction of the ear on the plant when ripening. The height at which the ears are borne was also very regular, and is more noticeable probably in this variety than any of the others. Good supplies of seed of this variety will be available for distribution this season.

Improved Yellow Dent.

Arrangements were made for several plots of this variety, but only two of these were finally planted owing to the other growers being unable to get the land ready in time. Both crops made good growth, but one of these did not cob as well as is usual for this variety owing to excessively wet conditions. This, however, should give a fair yield. An ear to row test was sown with this crop, but was badly checked during early growth through water remaining on the surface of the land. Weeds also made great headway owing to the sodden nature of the ground not permitting of inter-row cultivation being carried out for several weeks after the crop was above ground. A few rows which were not subjected to flooding made good growth, but the remainder will be too poor for comparison purposes. The other crop made excellent growth, and although rather too much rain fell during the growth of the crop a good yield resulted. The ears on the whole were fairly large and were particularly well filled. The type throughout was excellent, and a large quantity of very nice quality seed was selected.

Northern Seed Maize Improvement Scheme.

This work was continued on the Departmental plot at Burnside, Tolga. Approximately 70 acres were sown, and the results from one portion (30 acres) were excellent, whilst the yield from the other portion sown at the same time and only about 2 chains away was very poor. Weather conditions during January and February were very unfavourable owing to lack of sunshine and the continuous rain, which amounted to over 40 inches for these two months. As a result rust appeared, one portion of the crop suffering very much more severely than the other. Weather conditions, fortunately, improved, and bright, warm weather followed, otherwise the damage, not only to this crop but to a large percentage of those throughout the Tableland, would have been very severe. The type and quality of the grain on the best portion of the Departmental plot were particularly good, and the percentage of grain affected with Diplodia was very small indeed, as was also the percentage of barren plants. The crop at the time of inspection was ready for harvesting, and some very fine selections of seed were made for further plot work. Three comparative trials with this variety and a selection from the local maize were conducted, and the results were as follows:—

Farm No. 1.—Local maize—Barren plants, 13 per cent.; Diplodia, 9½ per cent.; other moulds, 4 per cent. Yield per acre, 26.5 bushels. Durum—Barren plants, 13 per cent.; Diplodia, 11 per cent.; other moulds, 4½ per cent. Yield per acre, 21 bushels.

Farm No. 2.—Local maize—Barren plants, 11.6 per cent.; Diplodia, 12 per cent.; other moulds, 5.6 per cent. Yield per acre, 54.7 bushels. Durum—Barren plants, 7.6 per cent.; Diplodia, 13 per cent.; other moulds, 5 per cent. Yield per acre, 40.6 bushels.

Farm No. 3.—Local maize—Barren plants, 2½ per cent.; Diplodia, 13 per cent.; other moulds, 13½ per cent. Yield per acre, 81.9 bushels. Durum—Barren plants, 5½ per cent.; Diplodia, 9½ per cent.; other moulds, 11 per cent. Yield per acre, 63.8 bushels.

The plots on Nos. 1 and 2 suffered from rust, and all were damaged during growth by leaf-eating caterpillars, the damage in the case of the former crop, being very severe. In the crop sown on No. 3 farm the damage to the Durum from this cause was much greater than in the portion sown with local seed.

MAMMITIS.

By MAJOR A. H. CORY, V.D., M.R.C.V.S., Chief Inspector of Stock.

Under this heading may be included all derangements of the udder which are accompanied by inflammatory changes.

Of all the domesticated animals, the cow suffers most from this complaint, due to the extraordinary development of the mammary glands, as compared with those of the original type. Increased secretory power is accompanied by increased blood supply and glandular tissue, but a decreased resistance to disease.

Mammitis may be divided into two broad classes—(1) simple, (2) specific.

Simple Mammitis.

In the first class would be included all those forms in which the primary cause is mechanical, such as injuries, overstocking, irregular or improper milking. In these cases the onset of the disease is ushered in with local inflammation, in the area affected. This may be a portion or the whole of a quarter, or even one or more quarters may be involved. Should the affected area be extensive, there will also be constitutional changes, such as rise in temperature and loss of appetite. The local inflammation induces congestion, with the accompanying symptoms of heat, pain, hardness, and cessation of normal milk secretion. The secretion from the congested area is watery, and acid in reaction. This acid fluid, coming in contact with the normal milk in the teat duct, causes it to curdle, and the milk from that quarter will contain clots of curdled milk. Should proper attention be given to the case at this stage, the disease is arrested, and recovery quickly follows. First give a good active purgative, such as 12 to 16 oz. Epsom salts, mixed with a quart of warm water. To this mixture add a cup of treacle and a dessertspoonful of ground ginger, and give as a drench. Local treatment consists of hot foments to the part, and frequent milking. Fomentations to be of value must be long continued—at least two hours once or twice daily—and followed by well rubbing with equal parts of belladonna and soap liniments.

Specific Contagious Mammitis.

If treatment has been omitted at this stage, pus-forming organisms invade the inflamed area, gaining an entrance through the milk ducts. The affected area is now an ideal breeding-place, and they multiply very rapidly. Fluids drawn off at this stage will contain pus (matter) in addition to the curdled milk.

In the blood stream are certain cells called Phagocytes, whose function is to destroy invading bacteria. These Phagocytes collect in and around the affected area. If they are not sufficiently numerous to destroy the bacteria, they cluster in the surrounding tissue to prevent the spread of the invading organisms. But during this time the toxins produced by the bacteria have caused a breaking down of the cellular tissue, which, when mixed with the toxins, has a debilitating action on the organisms, which lowers their vitality. To further neutralise the action of the bacteria, certain substances known as Opsonines or Antibodies appear in the blood stream and collect around the affected area and eventually destroy the invaders. The organisms having been destroyed, the temperature of the part is reduced, but the presence of the pus produced by their activity still remains and acts as a mild irritant. Should it be small in quantity, it is absorbed into the system, but where the accumulation is considerable, an abscess is formed.

Should the seat of the abscess be deeply surrounded by tissue, the fluid portions are absorbed and a fibrous capsule develops around the remainder. Should the abscess be near the surface, an external opening is formed and the contents evacuated, and the broken-down tissue is replaced by non-secreting tissue. Occasionally the abscess breaks into a milk duct, and the pus can be drawn through the opening in the teat.

During what may be termed the secondary stage of the disease—that succeeding bacterial invasion—hot fomentation is of pronounced value, as it assists in reducing temperature by relaxing the tissues, and also induces a freer blood supply to the part. Should pain be severe, apply a mixture of equal parts of belladonna liniment and soap liniment. Should the weight of the organ cause distress, support it by a broad bandage about 2 feet wide, in which four holes have been made for the teats. Place the teats in the holes, and pass the ends over the loins, tying sufficiently tightly to support the weight of the udder.

This serious disease is continually being brought under notice through outbreaks occurring in dairy herds, and its spread may be attributed partly to the carelessness of the dairy farmer and partly to the want of proper hygienic methods of controlling it.

The disease is a catarral affection and is limited, in most cases, to the delicate mucous membrane lining the milk ducts of the mammary gland. As a rule there is very little heat or swelling; moreover, the affected parts are not particularly painful.

The disease is caused by a tiny chain-forming micro-organism, or streptococcus, which attacks the mucous membrane and, by the development of its poisonous products or toxins, causes a rapid destruction of tissue cells and leucocytes (or white blood corpuscles) which are attracted to the spot. These dead cells produce that peculiar feature of the disease—a yellowish, purulent discharge, or pus, which can be withdrawn from the affected quarter.

Symptoms.

In the acute form the first symptoms are a diminution in the milk yield (usually in but one quarter of the udder); a definite acidity of the milk, and a tendency for it to become rapidly coagulated. Gradually the milk assumes a dirty, brownish colour and becomes more curdly, the amount of secretion from the affected quarter diminishing owing to the thickening of the milk ducts, which finally become impervious and the whole quarter is rendered useless. The lesions develop slowly, and first one quarter then another of the udder becomes involved, and later the milk secretion is liable to stop entirely. It will be observed in some cases of slight infection that the milk does not appear to be curdled, and the deposit when settled is so very small as to be overlooked.

Methods of Transmission.

Undoubtedly the transmission of the disease from cow to cow is through the agency of the hands of the milker or the cups of the milking machine. This appliance, which was designed to enable the farmer to produce cleaner milk than by any other method, must be kept scrupulously clean, and the cups should be sterilised after each milking by means of washings with boiling water.

Before and after each milking of an affected animal, the hands of the milker and the teats and udder of the cow should be washed with some reliable disinfectant solution, such as Hycol, Kerol, or Cyllin diluted in the proportion of 1 part of disinfectant to 250 parts of water—that is, 1 teaspoonful to 1 quart. Care must be taken not to allow any of the milk or cream from healthy animals or any of the dairying utensils to become tainted with the disinfectant, as the flavour and odour might be detected in the butter. To obviate this the disinfectant, after being allowed to act for ten minutes, should be washed off with sterilised water—that is, water that has just previously been boiled and allowed to cool.

Once the disease has appeared in a herd, the owner should personally examine minutely every cow's udder before milking and note carefully the character of the first small quantity of milk drawn. Any cow that shows signs of the disease, or that is in any way suspicious, should be held over to the last for hand-milking, and on no account should the cups of the milking machine be used on her.

Milk from an affected cow must be considered dangerous. The animal should be milked last into a vessel kept specially for the purpose, and the milk scalded so as to destroy the mammitis germs and buried.

Vaccine Treatment.

Both preventive and curative treatment have been successfully carried out by means of vaccine prepared at the Stock Experiment Station, Yeerongpilly. When used as a preventive the vaccine confers a period of immunity to contagious mammitis which varies very considerably in individual animals, and in no case is it thought that this period exceeds twelve months. The most opportune time to use the vaccine for protective purposes is just before or after calving, when the cow is usually most susceptible.

A "stock" vaccine may prove useful as a curative, but the best results are usually obtained from an autogenous vaccine—that is, one prepared from the particular strain of germ affecting the animals it is proposed to treat. To prepare such a vaccine it would be necessary for the Government Bacteriologist, Stock Experiment Station, Yeerongpilly, to receive a few teaspoonfuls of strippings from the affected quarter of a cow, forwarded with as little delay as possible in a clean bottle with no preservative added. A few days are required to prepare the vaccine, which will remain potent for about six months.

Directions for Use.

The vaccine is injected into the loose subcutaneous tissue behind the shoulder in the same manner as tick fever inoculation is performed, and the ordinary 10 c.c. tick fever inoculating syringe and needle are necessary to carry out the work. These may be obtained from any veterinary supply house.

The full dose of vaccine in ordinary cases is 4 c.c., injected in two doses of 2 c.c. each, with an interval of forty-eight hours between the injections. Two injections of 2 c.c. each will usually effect a cure, but in cases of long standing it might sometimes be found necessary to continue the treatment.

Before the injections are commenced the syringe and needle, with the parts loosened, should be sterilised by boiling in water for ten minutes, and the skin of the animal at the proposed site of injection should be washed with a solution of Hycol, Kerol, or Cyllin—1 teaspoonful to 1 quart—for ten minutes.

CONTAGIOUS MAMMITIS VACCINE—SCALE OF CHARGES.

No. of Animals.	Charge. *s.*	*d.*
1	2	6
5	6	3
10	10	0
20	16	8
25	20	0
40	30	0
60	40	0
80	46	8
100	50	0

REMITTANCE MUST ACCOMPANY APPLICATION.

CLIMATOLOGICAL TABLE—SEPTEMBER, 1930.

SUPPLIED BY THE COMMONWEALTH OF AUSTRALIA METEOROLOGICAL BUREAU, BRISBANE.

Districts and Stations.	Atmospheric Pressure. Mean at 9 a.m.	Shade Temperature. Means. Max.	Means. Min.	Extremes. Max.	Date.	Min.	Date.	Rainfall. Total.	Wet Days.
	In.	Deg.	Deg.	Deg.		Deg.		Points.	
Coastal.									
Cooktown	30·08	82	67	88	14	57	24, 25	30	2
Herberton	..	75	51	82	14, 24	41	23	36	5
Rockhampton	30·13	81	57	87	10, 13	50	16	24	2
Brisbane	30·14	76	54	86	23	48	3	95	3
Darling Downs.									
Dalby	30·14	75	44	87	11	32	3	92	6
Stanthorpe	..	66	38	78	12	28	16,3	102	4
Toowoomba	..	69	45	78	9, 13	33	3	147	5
Mid-interior.									
Georgetown	30·04	90	61	95	15, 11	53	19	3	1
Longreach	30·07	86	53	97	12	45	24	0	0
Mitchell	30·14	76	43	89	9, 12	33	24	17	2
Western.									
Burketown	30·05	87	62	92	28, 29	55	4	0	0
Boulia	30·07	86	56	101	11	45	24	0	0
Thargomindah	30·12	76	52	95	8	42	27	12	2

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF SEPTEMBER, IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALL DURING SEPTEMBER, 1930 AND 1929, FOR COMPARISON.

Divisions and Stations.	Average Rainfall. Sept.	No. of Years' Records.	Total Rainfall. Sept. 1930.	Sept. 1929.
North Coast.	In.		In.	In.
Atherton	0·66	29	0·71	0·19
Cairns	1·70	48	1·21	0·96
Cardwell	1·55	58	0·46	0·51
Cooktown	0·59	54	0·45	0·26
Herberton	0·49	43	0·36	0·28
Ingham	1·52	38	0·80	0·39
Innisfail	3·60	49	1·24	1·81
Mossman	1·49	17	0·48	0·76
Townsville	0·84	59	0	0·17
Central Coast.				
Ayr	1·48	43	0	0·20
Bowen	0·84	59	0	0
Charters Towers ..	0·77	48	0·21	0·10
Mackay	1·62	59	0·07	0·24
Proserpine	2·19	27	1·81	0·18
St. Lawrence.. ..	1·27	59	0	0
South Coast.				
Biggenden	1·54	31	1·45	0
Bundaberg	1·64	47	1·54	0·18
Brisbane	2·00	79	0·95	0·48
Caboolture	1·87	43	0·73	0·36
Childers	1·81	35	1·64	0·11
Crohamhurst ..	2·65	37	0·21	0·35
Esk	2·16	43	1·58	0·45
Gayndah	1·55	59	2·40	0·08
Gympie ..	2·11	60	2·00	0·12
Kilkivan	1·71	51	0·85	0
Maryborough .	1·93	58	0·98	0·36

Divisions and Stations.	Average Rainfall. Sept.	No. of Years' Records.	Total Rainfall. Sept. 1930.	Sept. 1929.
South Coast—continued:	In.		In.	In.
Nambour	2·57	34	1·26	0·33
Nanango	1·81	48	1·16	0·17
Rockhampton ..	1·33	43	0·24	0·03
Woodford	2·20	43	1·52	0·20
Darling Downs.				
Dalby	1·69	60	0·92	0·08
Emu Vale	1·74	34	1·54	0·28
Jimbour	1·51	42	0·78	0·15
Miles	1·38	45	0·78	0·11
Stanthorpe	2·30	57	1·02	0·60
Toowoomba ..	2·15	58	1·47	0·36
Warwick	1·81	65	1·33	0·34
Maranoa.				
Roma	1·46	56	0·06	0·01
State Farms, &c.				
Bungeworgorai ..	1·03	16	0·13	0·02
Gatton College ..	1·55	31	1·15	0·20
Gindie	1·04	31	1·01	0
Hermitage	1·49	24	1·28	0·24
Kairi	0·66	16	..	0·45
Mackay Sugar Experiment Station ..	1·53	33	0·18	0·02
Warren	0·83	15	..	0

GEORGE. G BOND, Divisonal Meteorologist.

LUNG WORMS IN CALVES.

By A. H. CORY, M.R.C.V.S., Chief Inspector of Stock.

This affection is known as verminous bronchitis, hoose, or husk. The worms found in the lungs are the *strongylus micruris* and *Strongylus pulmonaris.* The former are the larger, being about 1 to 3 in. long; whilst the latter is only $\frac{3}{5}$ to $1\frac{1}{3}$ in. in length. This disease has been known since the year 1744, when Ruysch discovered worms living in the air passages of calves. Nicholls also refers to the same disease in 1756, when it assumed an epizootic form in England.

STRONGYLUS RUFESCENS.

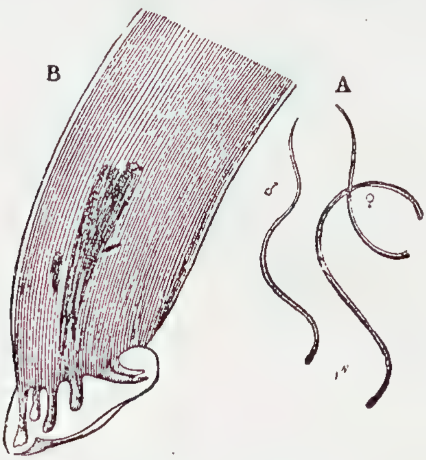
Caudal extremity of the male; magnified 100 diameters.—*Railliet.*

STRONGYLUS RUFESCENS.

Found in air passages of sheep and goats.

a—Male and female; natural size.

b—Caudal extremity of the female; magnified 50 diameters.—*Railliet.*



STRONGYLUS MICRURIS.

Found in air passages of calves and older cattle.

a—Male and female; natural size.

b—Caudal extremity of the male; magnified 100 diameters.—*Railliet.*

PLATE 169.

Symptoms.

If the worms are not very numerous, one notices an occasional husky cough; and, if the animals are driven or excited, the breathing may appear short and hurried. The disease gradually spreads from animal to animal until the majority exhibit this peculiar cough or hoose. After a few weeks, the cough becomes more frequent, and appears to be suffocating the animals—in some cases suffocation actually takes place. A frothy liquid sometimes streaked with blood is discharged from the nostrils. This discharge contains eggs, also embryo and mature worms. The movements of the worms are easily recognised, particularly when placed in a little warm water. The calf loses condition and strength; the mucous membranes of the eyes and mouth become very pale in colour; eyes sunken; skin hidebound, dry, and scurfy; the hair staring; and occasional diarrhœa. The animal wanders away from the others, and is found lying down apparently listless and poverty-stricken. The duration of the disease varies according to the number of worms present and the general condition and constitution of the animal. Some cases only last two or three weeks, whilst other survive for several months.

Upon *post-mortem* examination the worms can be found in the air tubes, the lining of which is inflamed; and the lungs frequently have a somewhat mottled or patchy appearance.

Prevention.

Healthy calves should be kept from paddocks where infested animals have been, but horses and sheep can be turned into them with safety. The land, if damp or boggy, should be drained; waterholes are a great source of infection, and should be avoided, if possible; buckets or troughs are better, as these can be frequently cleansed and disinfected. Keep up the strength of the animal by giving good nutritious food, and allow constant access to salt, because salt destroys the young worms as they are taken into the animal's body. Animals dying from this affection should be thoroughly burned or buried deeply.

Treatment.

The quickest and most reliable treatment is to inject a solution directly into the trachea (windpipe). Various solutions have been used; but the following is recommended, and is the dose for a calf:—

Oil of turpentine	1 drachm.
Carbolic acid	10 minims.
Chloroform	½ drachm.
Glycerine	1 drachm.

To be thoroughly mixed together before using each dose; then slowly injected by means of a syringe into the windpipe.

The needle of the syringe is inserted between the rings of the trachea (windpipe) about half-way down the neck. Some people advocate making a small incision in the skin with a clean knife before inserting the needle; but, if the needle is fairly thick and carefully handled when being pushed through the skin, it will be found unnecessary to incise the skin. This injection causes considerable distress to the animal by setting up paroxysms of coughing; but it passes off without setting up serious irritation, and is effective in destroying the worms.

In bad cases it is advisable to repeat the injection on two or three occasions, allowing some three days' interval between the injections; but in many cases one injection will be found sufficient.

If it is impossible to procure a syringe, a drench composed as follows can be given, but its action is not so effective:—

Oil of turpentine	½ oz.
Creosote	½ drachm.
Tincture of camphor	½ oz.
Milk or linseed oil	4 to 6 oz.

This drench should be given once or twice weekly for some three or four weeks.

Sheep, and particularly lambs up to twelve months of age, are similarly affected with worms in the lungs, although not the same worms as found in calves. The treatment described in these notes will be found just as effective, except that the dose of medicine given is considerably smaller—viz., about one-quarter to one-half of the above doses.

The Young Farmer.

TRAINING THE YOUNG FARMER.

DISCUSSING the training of young people for land industries in a recent issue of the "Live Stock Journal" (England), "Salopian," though writing especially for his readers in Britain, expresses some definite opinions on a subject of great interest to Australians, and his views are well worth quoting. This is what he says:—

In spite of the fact that no other industry has so bad a name as agriculture as a money-making business, there appears to be no diminution in the number of young men who are anxious to take up farming as a profession, so that the question of agricultural training is of greater importance than ever, considering the many problems and difficulties that must be faced and overcome if a living is to be made out of the land. Everything is cut so fine nowadays, and the margin of profit, where it exists, is so small that a thoroughly practical and scientific knowledge of everything connected with farming and livestock breeding and management is absolutely essential if that calling is to be made a success.

PLATE 170.—MR. A. SYBERG'S MILKING SHED AT MUGGLETON, NEAR ROMA.
This substantial structure was built of timber cut and sawn on the farm, and erected by Mr. Syberg with the help of one man.

Practical Training Essential.

Not only are many young men taking up farming as a profession, but a large number take up an agricultural training with a view to obtaining one of the numerous posts that are now available for the purpose of teaching farmers how to farm, county council lecturers, agricultural organisers, and so forth, so that agricultural training is becoming very much more advanced than it was a generation ago. At the same time it is very important that any boy or youth who intends to take up farming seriously with a view to making a living by it should begin at the right end and obtain a thoroughly practical knowledge of the business before taking up the scientific side. Unfortunately, very many obtain scientific training before going through the practical part, with results that are only to be expected.

To begin with, any boy who is brought up on a farm has an advantage over those who are town bred or have no family connection with farming, as he has had the opportunity of seeing for himself from his earliest childhood all the different phases of animal life and farm work, so that horses and cows, lambs and calves, and their habits and necessities are all quite familiar to him, as well as ploughing and sowing, haymaking and harvesting, and so forth by the time he is old enough to leave home to go to school.

He is often sent on little errands in connection with some matter or other, helps with the animals, perhaps feeds the calves and learns to milk, so that by the time he is ten years old he has a fair idea about farming operations, and if he does not know the why or the wherefore of everything he sees, yet he sees things done; and youthful impressions generally stick. The town-bred boy, on the other hand, sees and knows practically nothing till the time comes for him to leave school, when he is probably sent for a short time on to some farm or other to see how he likes it. This is previous to deciding what course he is to take to learn the art and science of agriculture.

PLATE 171.—MR. A. SYBERG'S MILKING SHED AT MUGGLETON, NEAR ROMA.
Interior, showing bails installed on the echelon principle. The floor is of solid concrete.

Which Course?

The question is: Which is the best course to adopt in each of the above cases to give a boy a thoroughly practical as well as scientific training? It stands to reason that the farm-bred boy and the town-bred boy will need something different in their courses of instruction. The one has everything to learn, the other a great deal, while he has also probably something to unlearn. The only courses of instruction open are a period of pupilage with a thoroughly good and practical farmer and a course at one or other of the agricultural colleges. The great majority of farmers' sons are compelled through force of circumstances to learn what they can at home, supplemented when possible by what they can gather at county council

lectures. Some who are more fortunate are able to have a year or two with some other large farmer, perhaps in another county, where they may have the opportunity of seeing a different and perhaps better and more up-to-date form of management than at home, and then finish up with a year or two at an agricultural college. Those not bred on farms must either go as farm pupils or to a college, or both.

When?

There can be no question as to the value of a course at an agricultural college in these days when science is becoming more and more applied to agriculture, but the question is when is the best time to have the course. To my mind, it is absolutely essential that before a young man enters an agricultural college he should first of all have had a thoroughly practical training on a farm. If he can

PLATE 172.

This well-built and equipped Dairy is on Mr. Syberg's Farm at Muggleton, near Roma. Every practicable provision has been made for ventilation and coolness.

learn to apply science to practice he will stand a chance of succeeding; but if he cannot apply practice to science, or, in other words, if he is full of scientific knowledge and has no practical knowledge, the end will be disastrous.

At the agricultural colleges such subjects as the influences of the various kinds of fertilisers on different soils, on the necessary constituents to plant life, the proper balancing of food rations, and so forth, receive greater attention than the fundamental practical principles of farming. Anyone who is to make a living by farming must thoroughly understand the working of and the management of stock,

how to buy and sell, the management of men and how much work they ought to get through in a day, and how their work should be done, and be able to show them how to do it if they do not know. All these things should be thoroughly learned on a farm before any course is taken at an agricultural college. Then a year or two there, where a knowledge of agricultural chemistry can be acquired together with some scientific knowledge of dairying and veterinary work, will be found a most useful finish to the practical training received on a farm.

Too Much Science.

In agricultural teaching there is nowadays too much science and not enough practice. All our lecturers are brimful of scientific knowledge, and it is hopeless for any young man, however practical he may be, to attempt to get a post as a lecturer unless he has great scientific qualifications. His practical knowledge appears to be of little account, and yet what is wanted is a man who can lecture on the practical principles of farming in every branch, with sufficient scientific training to know where science can be profitably applied to practice. Many of our lecturers talk above the heads of their audience, and some of them try to impart notions which practical farmers know by experience to be utterly impracticable. Many young men who have acquired most of their knowledge of farming at a college have to buy their practical experience when they take a farm to the tune of several hundreds a year for perhaps four or five years.

A hundred a year paid in premium for a few years with a thoroughly sound, practical, and well-educated farmer, followed by a year or so at a college, will save many hundreds of pounds afterwards. Scientific training has undoubtedly done much good in many ways, and has broken down many old-fashioned ideas and prejudices which have been proved to be wrong; but practical principles must be thoroughly installed first. The motto of the R.A.S.E. is "Practice with Science," and on those lines agricultural training should be given. In farming more than in perhaps any other profession or trade an ounce of practical knowledge is worth a ton of theory.

SUBSCRIPTIONS TO THE JOURNAL.

Subscribers are reminded that when a cross is placed in the square on the first page of the Journal it is an indication that the term of their subscription ends with the number so marked, and that it is advisable to renew immediately if they desire the retention of their names on our mailing list.

To farmers, graziers, horticulturists, and Schools of Art the annual subscription—one shilling—is merely nominal, and the charge is only imposed to cover the cost of postage. To them, otherwise, it is an absolutely free issue. Members of agricultural and similar societies who are not actively engaged in land pursuits are asked to pay five shillings a year, while the annual subscription charged to the general public is ten shillings.

Farmers particularly are urged to keep their names on our mailing list, for through the Journal they may keep themselves well informed in respect to the activities of the Department, and other matters with which they are directly concerned. Instead of sending just the annual subscription along it is suggested that, when renewing it, they do so for a longer term. For instance, five shillings would keep their names on our subscribers' register for five years. By doing this they would obviously help to reduce clerical labour as well as avoid the inconvenience to themselves of posting annually the very small sum necessary to keep their names on our mailing list.

On another page an order form may be found, and for those whose annual subscription is about due what is wrong with filling it up now and posting it direct to the Under Secretary, Department of Agriculture and Stock?

Answers to Correspondents.

BOTANY.

The following answers have been selected from the outgoing mail of the Government Botanist, Mr. C. T. White, F.L.S.:—

Emu Apple.

E.G.L. (Maleny)—

The Emu Apple, common in Western Queensland and New South Wales is *Owenia acidula*, the genus Owenia being named in honour of the late Professor Owen of the British Museum. So far as we know neither seeds nor plants are stocked by seedsmen, and your only hope of getting seeds would be to write to a friend in the West in the country where trees are growing. As you remark, it is a beautiful tree, though it seems rather hard to propagate. If you cannot get the Emu Apple, the Tulip Tree (*Harpullia pendula*) is a native tree that does well in your locality, and should be suitable for your purpose. The Queensland Nut (*Macadamia ternifolia*) often also makes a handsome tree, also the Crow's Ash (*Flindersia australis*), though the latter eventually grows rather big for a lawn specimen.

Forget-me-not.

C.S. (Caboolture)—

The specimen is *Cynoglossum australe*, commonly known in Queensland as Forget-me-not, and very closely allied to the true Forget-me-not of Europe. So far as known, neither this plant nor any of its allies possess any harmful properties.

Botanical Specimens from Miles.

INQUIRER (Brisbane)—The specimens collected in the vicinity of Miles have been determined as follows:—

1. *Triodia irritans.* Spinifex.
2. *Amphipogon strictus.* A common grass on poorer soils in the West. I have not heard a common name for it and should consider it of only secondary importance as a fodder.
3. *Andropogon sericeus.* Blue Grass.
4. *Eriochloa annulata.* Dairy Grass.
5. *Tetragonia expansa.* New Zealand Spinnach.
6. *Andropogon refractus.* Barbed-wire Grass.
7. *Chenopodium triangulare.* Fish Weed. A good fodder.
8. *Plantago varia.* Small Plaintain.
9. *Rhagodia linifolia.*
10. *Enchylaena tomentosa.* A Cotton Bush.
11. *Callotus lappulacea.* A "Bindy-eye."
12. *Amphipogon strictus.* Same as No. 2.
13. *Aristida ramosa.* A three-pronged Spear Grass.

Native Frangi-panni.

M.R. (Toowomba)—

Your specimen is *Hymenosporum flavum*, a native tree of the Pittosporaceæ or Pittosporum family. We have heard it called Native Frangi-panni. It is a beautiful tree and well worthy of cultivation for ornamental purposes. It is moderately common in South-Eastern Queensland, particularly along creek banks, but is not confined to such situations.

Finger Cherry or Native Loquat—A Cause of Total and Permanent Blindness.

T.B. (Townsville)—

The specimen is the Finger Cherry or Native Loquat, *Rhodomyrtus macrocarpa*, one of the most dreaded fruits in North Queensland, as it at times contains a poisonous principle which destroys the optic nerve, thereby causing permanent blindness. There is no doubt about the effects of this fruit, as there are quite a number of cases on record of permanent blindness having been caused by it, some of the sufferers now being inmates of the Blind and Deaf and Dumb Institution. It is not known what the poisonous principle is. It has been thought to be a fungus which invades the fruit, but this fungus, or allied forms at least, are found in most over-ripe fruits and are not known to cause harm in any way. The plant contains a saponin, and this has been regarded as the cause of the trouble. Possibly the saponin tends to disappear as the fruits ripen, but of this we have no knowledge. Certain people affirm that they have eaten the fruit both raw and cooked, and no ill effects have followed. However, the danger exists, and it is well not to partake of the fruit at all. The matter is one worthy of investigation, but so far has never been systematically investigated by chemists or medical men.

Stagger Weed or Wild Mint.

D.W.McL. (Rosewood)—

The specimen is *Stachys arvensis*, the Stagger Weed or Wild Mint. Resting stock are usually unaffected by this plant. In feeding experiments with sheep, lambs were seen to be more susceptible than adult sheep. Symptoms are not manifested as a general rule until the sheep ar driven, the distance travelled before the symptoms become apparent varies from a few hundred yards to one or two miles. Cattle so far as we know as unaffected.

Lamb's Tongue.

D.H. (Boggabilla)—

The specimen is *Plantago varia*, a species of Plaintain or Rib Grass. The common Lamb's Tongue of Europe belongs to the same genus and the properties of the Queensland plant, which is very closely allied, are probably the same. The affinities are so close that there is no reason why the present plant should not receive the name Australian Lamb's Tongue.

Hexham Scent. Burr Trefoil.

J.A.F. (Kingaroy)—

The larger plant is the Melilot or Hexham Scent (*Melilotus parviflora*), a fairly common weed in Queensland, particularly on the Darling Downs during the winter and spring months. Some years ago it was boomed as a fodder under the name of King Island Melilot, and has a certain value for land that is not suitable for lucerne or better class fodders. It is apt to taint milk rather badly.

The smaller plant is the Burr Trefoil (*Medicago denticulata*), a very common weed in Queensland during the winter and spring months. It makes quite good fodder for cattle, though in its more succulent stages is apt to bloat them badly if they feed largely on it. As the plant dies off it leaves a mass of burr-like pods, but these are eaten by stock, particularly sheep, and have a definite food value. The plant should make good hay, but we think the specimens you sent are, perhaps, now rather far advanced for that purpose.

Barley Grass.

C.P.C. (Oakey)—

The grass is *Hordeum leporenium*, Barley Grass, a native of the Mediterranean region, now a common naturalised weed in Australia. The grass in its very early stages provides a certain amount of winter fodder, but very quickly loses its palatability and food value as it comes into seed. The seeds are very objectionable as they get into the jaws, eyes, and nostrils of live stock, often causing irritation and sores. It is not worth propagating as a fodder grass in your locality.

"Kangaroo Apple."

H.A. (Tallebudgera)—

Your specimen is the Kangaroo Apple, *Solanum aviculare,* the berries of which are poisonous. The symptoms of poisoning by Solanum berries are usually stupefaction, staggering, loss of feeling and consciousness, cramps, and sometimes convulsions. The pupil of the eye is generally dilated.

New Zealand Spinach. French Catch Fly.

R.O. (Waterford).—The specimens are as follows:—

(*a*) *Tetragonia expansa,* New Zealand Spinach. A common weed in cultivation in Queensland, also found round cowyards, and in fact anywhere where the ground has been disturbed. The leaves are sometimes used as a substitute for ordinary spinach.

(*b*) *Silene gallica,* the French Catch Fly. A European weed now naturalised in most warm countries. It is very common in Queensland, but is not particularly aggressive.

The Prickly Poppy.

J.S. (Kingsthorpe)—

Your specimen is *Argemone mexicana,* the Prickly Poppy, a native of the warmer parts of America, but now naturalised as a weed in most warm countries. It is a very aggressive plant once it gets on to a property and is poisonous, though stock rarely touch it. The only cases that have actually come under our notice of stock eating it is where the plants have been cut down and allowed to wilt. It is gazetted a noxious weed throughout the whole State. It is a thistle-like plant and is sometimes known under the common names of Prickly Thistle, Californian Thistle, &c.

Plant Poisonous to Stock.

W.W.McL. (Murgon)—

No leaves were included in the specimen and those of vine, called by you Wild Grape Vine, are necessary for correct determination. However, the stem looked to us like that of *Vitis acetosa,* which contains a poisonous principle (calcium oxalate) which occurs in the form of crystals in the plant tissues and causes intense irritation of the soft parts of the mouth when the plant is chewed. If, however, poisoning was by this plant, the calves would slobber very much at the mouth with a great flow of saliva, and the mouth would also be somewhat swollen and very painful. We think you must look elsewhere for the trouble. We suggest your sending small pieces of any plant under suspicion down for determination and report. Pieces a few inches should suffice and preferably with either flowers or fruit, but leaves certainly are essential.

Plant Specimens from the Barrier Reef.

T.A.P. (Toowoomba)—The specimens from the Barrier Reef have now been determined as follows:—

1. *Achyranthes aspera,* sometimes called Needle Burr, though this name is applied also to other plants in Queensland.
2. *Stenotaphrum subulatum.* A grass allied to the common Buffalo Grass.
3. *Cordia subcordata.*
4. *Celtis paniculata* as far as can be told from the specimen which bears leaves only.
5. *Abutilon indicum.*
6. *Scaevola Koenigii.* This plant is widely spread over the Malayan region and the Pacific. The pith is sometimes used for the making of artificial flowers.
7. *Tournefortia argentea.*

Tanning Marsupial and Other Skins.

We have received numerous letters asking for instruction in curing and tanning these and other skins. Perhaps the following methods will prove satisfactory:—

The general principle is to trim off the useless parts of the skins and remove all fat from the inside. Then soak the skins in warm water for about an hour. Then apply a coating of borax, saltpetre, and Glauber's salts—1 oz. of each, dissolved in sufficient water to make a thin paste. On the following day give a coating of a mixture of 1 oz. of sal. soda, ½ oz. of borax, and 2 oz. of hard soap. This latter mixture should be slightly heated without allowing it to boil. After this, fold the skin together and leave in a warm place for twenty-four hours. Then take 4 oz. of alum, 3 oz. of salt, and 2 oz. of saluratus; dissolve these in hot water, and, when cool, soak the skin in it for twelve hours. Wring out, and hang up to dry, If you find the skin not sufficiently soft, repeat the soaking and drying two or three times.

Another method is, first to remove the flesh and fat. Then wash the skin in a solution of sal. soda and water. Take 4 oz. of powdered alum, 8 oz. of salt, 1 quart of new milk to 4 gallons of salt water, and 1 pint of prepared starch. Stir well, and then put in your fur skins. Air them often by hanging them over a stick laid across your tan tub. Handle this occasionally until they have been in the liquor for a day or two. Then remove the skins and add to your liquor a half teaspoonful of sulphuric acid. Stir this well into the liquor. Put the skins back and steam them well for about an hour. Then take them out and wring and rinse off in soft lukewarm water, and hang them up in a cool place, and when they begin to get white work and stretch them till they are dry.

Hides of larger animals, such as kangaroos, calves, &c., should remain longer in the solution.

To cure a tough skin, trim it on the flesh side with a sharp knife and then well brush with a solution of 2½ lb. of alum and 1 lb. of common salt in 1 gallon of warm water. The skin should be treated two or three times with this solution on successive days. Now sprinkle bran all over the skin, brush out, and nail the skin to a board to dry it.

Note that each kind of skin requires some special treatment—that is, all skins cannot be tanned in the same manner—but the general principle is the same as above.

Still another method is by what is known as "the lighting tanning process," which is said to be the quickest method of tanning wallaby, rabbit, and other skins and is very simple. It is as follows:—Pour five or six quarts of boiling water over two quarts of bran, and then strain the infusion. Make an equal quantity of salt water, by adding to bloodwarm water as much salt as it will dissolve. Mix the bran and salt water, and to each gallon of the mixture (when no more than lukewarm) add an ounce of sulphuric acid (H_2SO4). Immerse the skins in the liquor, stirring them occasionally until tanned, which will be in about twenty minutes. When tanned, rinse in clean water and hang out in a shady place to dry. Pull and stretch them well while drying. By sufficient pulling they can be made quite white. Dry skins should be soaked in warm water before tanning till they are quite soft and white.

AN INFORMATIVE JOURNAL.

Another Brooklands farmer, in renewing his registration, writes (15*th October,* 1930):—" . . . *There is too much information in the Journal for me to go without it.*"

General Notes.

Skinless Barley Exempted from Operations of Barley Board.

When the Barley Board was constituted it was understood by the growers that the Board would not apply to skinless barley, but only to malting barley. However, the Board was so constituted as to apply to all barley produced in Queensland; but under the Acts the Board is given power to exempt from its operations such sales and purchases or receipts of the commodity as may be prescribed or approved by the Minister. Upon the request of the Board, the Minister for Agriculture and Stock has now approved that all sales of skinless barley shall be exempted from the operations of the Board, and accordingly the Board's operations will in future apply only to malting barley.

South Burnett Tick Cleansing Area.

A deputation of stockowners of the Murgon and Wondai districts, introduced by Messrs. J. B. Edwards and E. H. C. Clayton, M.L.A.'s, waited upon the Minister for Agriculture and Stock (Hon. H. F. Walker, M.L.A.) recently, with reference to the tick cleansing operations in the South Burnett. The members of the deputation pointed out the hardships and inconveniences to stockowners involved, and advocated that the operations be confined to the area originally worked when the cleansing area was first proclaimed. In reply, Mr. Walker stated that he recognised the importance of the matter, and that he had already promised Mr. Edwards, M.L.A., that he would personally visit the area concerned with a view to obtaining first-hand information regarding the position. Mr. Walker also stated that he was in receipt of a counter petition, and at the first opportunity would visit the district in company with representatives of the stockowners concerned, also Departmental officers, and go thoroughly into the question.

Staff Changes and Appointments.

Mr. H. J. Walker, Inspector of Slaughter-houses, Bundaberg, has been also appointed an Inspector of Stock and Brands.

Mr. E. J. Lorraine, Inspector under the Diseases in Plants Act, has been also appointed an Inspector of Stock.

Mr. C. A. Williams, of Goondiwindi, has been appointed an Honorary Inspector under the Diseases in Plants Act.

Mr. S. H. Harding, of Ipswich, has been appointed a member of the Southern District Stallion Board, vice Mr. Ernest Baynes, deceased.

All full-time Inspectors of Stock, Slaughter-houses, Dairies, and Plants, in the employment of this Department have been appointed also Rangers under and for the purposes of the Animals and Birds Acts.

Sanctuary for Animals and Birds at Emu Park.

From 1893 until the present time the only Sanctuary for Animals and Birds at Emu Park has been the Reserve for Water (R. No. 309), on the south-western side of the Emu Park Branch Railway line. This sanctuary has now been extended to include the adjoining Recreation Reserve, R. 311, and, on the opposite side of the railway line, the Reserve for Water, R. 318, and the Reserve for Botanical Gardens, R. 325. Included in this extension of the Sanctuary are also parts of Marine parade, and of Nicholson, Pattison, Pears, and William streets, and also a short length of the reserve for the Emu Park Branch Railway.

Scour in Pigs.

Mr. C. G. Dale, of Lagoon Pocket, Mary Valley Line, Queensland, recently had a young pig seriously affected with blood scour of a type similar to that from which calves occasionally suffer. As the animal was in extreme pain and appeared to be rapidly failing, urgent treatment was necessary, and as there were no other remedies to hand, Mr. Dale administered a dose of two tablespoonful of brandy mixed with white of egg. This stimulating drench had its effect and, in due course, the animal began to pick up again, and in a day or two was on its feet again well on the way to recovery. Such remedies are often effective and are always well worth trial.

Share Dairymen.

We have a number of applications from experienced dairymen, with satisfactory records and the requisite family labour, seeking the working of a dairy herd on shares. Though no responsibility is undertaken, we would be glad to know of any dairy farmer who is contemplating letting his herd on shares, with a view to placing him in communication with the applicants referred to.

Extension of Northern Pig Board for Five Years.

The Northern Pig Board, which was first constituted in 1923, was reconstituted in 1926 for a period of five years as from the 1st January, 1926, and was made to apply to all pigs grown in the Petty Sessions Districts of Atherton, Herberton, Chillagoe, Cairns, Douglas, and Mourilyan during that period. As the Board will expire on the 31st December, 1930, an Order in Council has been issued giving notice of the intention of His Excellency the Governor in Council to extend the Board for a period of five years—that is to say, until the 31st December, 1935. The Order in Council also provides that growers may lodge a petition for a poll to be taken on the question of whether the Board should be so extended or not. Such petition must be signed by not less than 10 per cent. of the pig-growers to which the Board applies —that is, persons who, at any time during the last six months, produced pigs for sale in the Petty Sessions Districts of Atherton, Herberton, Chillagoe, Cairns, Douglas, and Mourilyan. The petition, if any, must reach the Minister on or before the 10th November, 1930.

Nominations for Growers' Representatives.

Nominations will be received by the Returning Officer, Department of Agriculture and Stock, until 5 p.m. on the 10th November, 1930, for election for one year as Growers' Representatives on the Northern Pig Board.

Five such representatives are to be elected by those persons who, at any time since the 16th June, 1930, kept pigs in any of the Petty Sessions Districts of Atherton, Herberton, Chillagoe, Cairns, Douglas, and Mourilyan.

Each nomination is to be signed by at least then such growers.

If more than five nominations are received, a postal ballot will be taken, and the election, if any, will be held on the 17th December, 1930.

To ensure their names being on the roll, persons eligible to vote at this election are invited to send their names and addresses at once to Mr. A. H. Jones, Returning Officer, Department of Agriculture and Stock, Brisbane.

The Roadside Market for Fruit and Vegetables.

In recent years, largely as the result of the growth of motor traffic, a new and often profitable outlet for their products has presented itself to fruit and vegetable growers in the form of the roadside market. In some cases it is the practice of the grower merely to set up a sign directing the attention of the traveller to the fact that produce is procurable from his property, while others find it advantageous to set up a stall on the roadside adjacent to it. Others yet again, situated less favourably in regard to traffic, erect a stall on the roadside in some more suitable place.

In the establishment of this type of market certain points must be observed. The stall should be situated on that side of the road on which the bulk of the traffic passes on the homeward journey. The convenience of the potential buyer should be studied. The stall should not, for instance, be located on a steep hillside; a better point would be on the hilltop. Warning notices could with advantage be set up on the hill, however, the slow speed necessitated by the climb giving the traveller ample time to read them. What might be called psychology of such advertising is rather doubtful. A smart, attractive sign, it might be argued, is the surest sales-getter, but it would appear from the experience of an American grower that the laws operating are somewhat subtle. An up-to-date sign, he found, was much less effective than one of a less pretentious sort, travellers presumably fearing that such advertising betokened a shrewdness which made the chances of bargains proportionately remote. It is advisable to have the prices of the commodities on roadside stalls plainly displayed.

Weighing Butter for Moisture Tests.

In making a test for moisture in butter, the weighing of t e samples in the orthodox manner by means of a chemist's scales takes too much time for the factory operative who is not skilled in handling the weights, or is not quick at figures. The use of the scales and method of calculation of test results may be simplified in this way:—

Exactly balance the evaporating cup on one scale pan by means of a weight on the other. This weight may be made from sheet lead or other metal. If the piece of metal is cut to as nearly as possible the same weight as the cup, any further necessary adjustment may be made by means of the screw-nuts on the ends of the scale beam.

In making the test, first see that the empty cup and the weight exactly balance, then place a ten gram weight on the scale pan with the aforesaid weight. Now place sufficient of the prepared butter sample in the cup to again balance the scales. The sample in the cup will then weigh exactly ten grams. Evaporate the moisture in the usual way. Cool the cup and sample. Then again, balance the scales by placing the necessary weights on the scale pan with the cup and sample.

The percentage of moisture may then be read direct from the total of the latter weights by shifting the decimal point one place to the right, thus, if the weights required to re-balance the scales after the moisture in the sample has been evaporated total 1.56 grams, then the percentage of moisture is 15.6.—F. J. WATSON, Dairy Instructor.

Cost of Loss of Milk Fat in Separating Milk.

Every dairyman knows that loss of milk-fat in separating means to him a loss of money, but many do not realise the extent of the loss even when the result of the Babcock test of the separated milk is known.

In separating, a small amount of fat, which is not recoverable by mechanical separation, is always lost; but should the amount exceed 0.05 per cent., either the mechanism or the manipulation of the separator is at fault.

The following table will give some idea of what extent the loss will be when the actual waste of fat exceeds the amount not recoverable by mechanical means.

Presuming the average yield is the modest amount of one pound of commercial butter to twenty-five pounds of milk, the loss will be as follows:—

Loss of	0.01 per cent.	is equal to	loss of 1 lb. in	400 lb.	com. butter
,,	0.02	,,	,,	200	,,
,,	0.03	,,	,,	133	,,
,,	0.04	,,	,,	100	,,
,,	0.05	,,	,,	80	,,
,,	0.06	,,	,,	66	,,
,,	0.07	,,	,,	57	,,
,,	0.08	,,	,,	50	,,
,,	0.09	,,	,,	44	,,
,,	0.1	,,	,,	40	,,
,,	0.2	,,	,,	20	,,
,,	0.3	,,	,,	13.3	,,
,,	0.4	,,	,,	10	,,
,,	0.5	,,	,,	8	,,
,,	0.6	,,	,,	6.6	,,
,,	0.7	,,	,,	5.7	,,
,,	0.8	,,	,,	5	,,
,,	0.9	,,	,,	4.4	,,
,,	1.0	,,	,,	4	,,

On the same basis of yield of butter from milk, a herd of cows producing 50 gallons of milk per diem will produce in one year 187,062 lb. of milk yielding 7,482 lb. of commercial butter, which at 1s. 3d. per lb. is worth £467 12s. 6d.

A loss of 0.01 per cent. of fat in separating would mean a loss for the year of £1 3s. 4½d.; a loss of 0.1 per cent. would cause a loss of £11 13s. 9d.; and a loss of 1 per cent. would be equivalent to £116 17s. 6d.

By this it will be seen how necessary it is that the separator should me maintained in perfect order and be operated continually at full speed when separating.—F. J. WATSON, Dairy Instructor.

The Home and the Garden.

OUR BABIES.

Under this heading a series of short articles by the Medical and Nursing Staff of the Queensland Baby Clinics, dealing with the welfare and care of babies, has been planned in the hope of maintaining their health, increasing their happiness, and decreasing the number of avoidable cases of infant mortality.

SAVE THE BABIES.

A Season of Danger for the Infant.

The hot season is coming. Probably more babies will die during the next three months than during any other three months of the year. It is (though it should not be) the dangerous season for babies. They will die of an infectious and preventable disease. Save the babies!

Last year 112 babies under one year died in Queensland of this disease; the year before 214 died—nearly twice as many. Have our Baby Clinics doubled the efficiency of their work in the past year? Are our Queensland mothers twice as wise? We wish it were so. A part of the decrease may be due to better mothercraft. Most of it was due to good luck. Possibly this year we may have bad luck. The summer before last Rockhampton suffered from a summer epidemic which killed fifty-one babies under two years of age in three months. This season some other town may be threatened by a similar epidemic. Shall we trust our infants' lives to luck, to chance, to fortune? Save the babies!

Summer diarrhœa, dysentery, gastro-enteritis, by whatever name you like to call it, is an infectious disease. It is caused by dysentery bacilli, which are carried about by flies. It is not caused directly by hot weather. Nor has the Jacaranda, which happens to flower at this time of year, anything to do with it. The infection is never present in freshly boiled or scalded milk, for boiling kills dysentery bacilli. If the milk was stale and dirty before boiling, it will give babies simple diarrhœa; it cannot give them dysentery. The milk may be infected after boiling, so may any kind of artificial food, so may the baby's bottles, teats, and dummies. Those who sell dried milks or patent foods may suggest that in them lies perfect safety. It is not true. Foolish beliefs put into mothers' heads are paid for in infants' lives. Save the babies!

Natural Food for the Young Australian.

Save your babies by giving them their natural food—the only food which is perfectly clean, fresh, and safe. Never wean a baby during the next three months if you can possibly help it. If you must wean it, or if it has been weaned already, exercise the utmost care. Scald the milk, scald the bottles, scald the teats, then keep them most carefully covered from flies. Every single fly may carry death for your babe, or, failing death, an anxious, painful, and enfeebling disease. The strongest and finest baby may die of it. Nothing can make the dummy safe. It is a perpetual attraction to flies. Burn it. You may think that the dummy keeps your baby from crying and makes him happier. You are mistaken; but even if you are right, it is better that some babies should cry a little than that one healthy baby should die of dysentery. Be warned in time. Save the babies!

The Responsibility of Local Authorities.

And you Municipal and Shire Councillors, you are partly responsible. The flies get most of their dysentery bacilli from your closet pans. No doubt you have excellent Regulations to prevent flies from getting access to these pans. Do you enforce those Regulations? Have you sufficient and efficient Inspectors? Do you prosecute? Unless you prosecute a few careless people, your Regulations are useless. Save the Babies!

Keep Cool.

We do not say that every mother who does her best will never lose her baby. That would not be fair nor true. There is no perfect safety for anyone in this world. But we do say that such cases will be very rare. There is no need, nor excuse, for foolish panic. Keep cool. Be very careful. Try not to make a single mistake. If you are in any difficulty, consult the Nurse at the Baby Clinic. She is always willing and anxious to help. If you live too far off, ask for a copy of the Queensland Mother's Book. It will be sent on application. Read it carefully. The lives of our Queensland babies are in the hands of our Queensland mothers. Resolve that this summer you will do your very best, God helping you. SAVE THE BABIES!

THE COMPOST HEAP.

The compost heap is a valuable adjunct to the farm, and especially on small areas, where some intensive form of agriculture, such as vegetable growing, is being carried out. A heap or pit can be made very economically. It utilises all sorts of vegetable and animal refuse which would otherwise be wasted, and converts it into a valuable manure, rich in vegetable matter and eminently suited for soils low in humus or subject to droughty conditions.

The principle of the compost heap is the fermentation of easily decomposed vegetable matter in the presence of earth and lime. Not only are substances like peat and straw, which form the usual basis of compost heaps, thus decomposable, but almost every kind of organic substance, both of vegetable and animal origin, can be composted. Dead leaves, bush scrapings, sawdust, weeds, tops and stalks of vegetables, as well as bone and animal refuse, can be treated in this manner. In the case of animal refuse the operation is much slower, and substances like bone should be first crushed. It is also important to be sure that animal refuse so treated is not derived from a diseased source.

The best way of making and maintaining the compost heap will depend largely upon local surroundings. As a general method of procedure the following will be found satisfactory. Make a heap with alternate layers of earth, refuse, and lime. Under the term "refuse" is included all the refuse material of animal or vegetable origin mentioned above. Cover the whole with a layer of earth. When a sufficient quantity of refuse is again collected, place it on top of the heap and cover with a layer of lime, and lastly of earth, until the heap is 3 to 4 feet high. The heap should be kept moist, and for this purpose all refuse water from the house, slops, &c., should be added. The heap may be conveniently watered by making a hole in the interior and pouring the liquid in. The final covering with earth has the object of absorbing any ammonia which is evolved in the process of fermentation and by the action of the lime.

When the heap has been prepared it must be left to itself to ferment for a greater or less time. Probably a few months will be sufficient, unless very refractory substances, such as bone, &c., are present. In a few months' time it should be well forked over and another layer of lime and finally of earth should be added. In the course of another month or two it should be ready for use, and will provide at a very slight cost an excellent manure rich in humus, and will have utilised for the purpose a great amount of refuse material which would otherwise have been lost or burnt.

When refuse material is burnt, the ashes, though still possessing manurial value on account of the line, potash, and phosphates they contain, are of incomparably less value than the original substances out of which they are derived, owing to the absence of humus material and of nitrogen, which have been lost in the process of burning.

Instead of a heap, the compost may be conveniently prepared in a pit. In either case the bottom should be cemented, or so drained that the liquid escaping from the mass can be collected and returned to the compost.

It will be found advantageous to prepare a second heap while the first one is ripening and being used. It will also be found that if it is desired to use more concentrated fertilisers, such as superphosphate, potash, and ammonium salts, these can be mixed with advantage with the compost manure before it is applied to the land. Used in this way they will be in less danger of leaching away, and will be of greater benefit than if applied directly to the land.

Orchard Notes for December.

THE COASTAL DISTRICTS.

The planting of pineapples and bananas may be continued, taking care that the ground is properly prepared and suckers carefully selected, as advised previously in these Notes. Keep the plantations well worked and free from weeds of all kinds, especially if the season is dry. New plantations require constant attention, in order to give young plants every chance to get a good start; if checked when young they take a long time to pull up and the fruiting period is considerably retarded. Small areas well worked are more profitable than large areas indifferently looked after, as the fruit they produce is of very much better quality. This is a very important matter in the case of both of these fruits, as with the great increase in the area under crop there is not likely to be a profitable market for inferior fruit. Canners only want first-class pines of a size that will fill a can, and cannot utilise small or inferior fruit, except in very limited quantities, and even then at a very low price. Small, badly filled bananas are always hard to quit, and with a well-supplied market they become unsaleable. Pineapple growers, especially those who have a quantity of the Ripley Queen variety, are warned that the sending of very immature fruit to the Southern markets is most unwise, as there is no surer way of spoiling the market for the main crop. Immature pineapples are not fit for human consumption, and should be condemned by the health authorities of the States to which they are sent.

Citrus orchards require constant attention; the land must be kept well worked and all weed growth destroyed. Spraying or cyaniding for scale insects should be carried out where necessary. Spraying with fungicides should be done where the trees show the need of it. A close lookout must be kept for the first indications of "maori," and as soon as it is discovered the trees should either be dusted with dry sulphur or sprayed with the lime-sulphur, potassium, or sodium sulphide washes. Borer should be looked for and destroyed whenever seen.

Early grapes will be ready for cutting. Handle carefully, and get them on to the market in the best possible condition. A bunch with the bloom on and every berry perfect will always look and sell well, even on a full market, when crushed and ill-packed lines are hard to quit.

Peaches, plums, papaws, and melons will be in season during the month. See that they are properly handled. Look out for fruit fly in all early ripening stone fruit, and see that none is left to lie under the trees to rot and thus breed a big crop of flies to destroy the mango crop when it ripens.

Keep leaf-eating insects of all kinds in check by spraying the plants on which they feed with arsenate of lead.

Look out for Irish blight in potatoes and tomatoes, and mildew on melons and kindred plants. Use Bordeaux or Burgundy mixture for the former, and finely ground sulphur or a sulphide spray for the latter.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

Early ripening apples, plums, apricots, peaches, and nectarines will be ready for marketing during the month. They are unsatisfactory lines to handle, as the old saw, "Early ripe, early rotten," applies to all of them; in fact, the season of any particular variety is so short that it must be marketed and consumed as quickly as possible. All early ripening deciduous fruits are poor carriers and bad keepers, as their flesh is soft and watery, deficient in firmness and sugar, and cannot, therefore, be sent to any distant market. The available markets are quickly over-supplied with this class of fruit, and a glut takes place in consequence. Merchants frequently make the serious mistake of trying to hold such fruits, in the hope of the market improving, with the result that, instead of improving, the market frequently becomes more and more congested, and held-over lines have to be sent to the tip. There is only one way to deal with this class of fruit, and that is to clear the markets daily, no matter what the price, and get it distributed and into consumption as rapidly as possible by means of barrowmen and hawkers. Most early ripening fruits are useless for preserving in any way, their only value being what they will bring for consumption whilst fresh. This being so, it is only a waste of time and money to forward immature, undersized, and inferior fruit to market, as it is not wanted, and there is no sale for it. It should never have been grown, as it is frequently only an expense to the producer, besides which, unless the fallen or over-ripe fruit is regularly and systematically gathered and destroyed in the orchard, it becomes a breeding ground for fruit fly and codlin moth, as well as of fungi, such as those producting the brown and ripe rots. Early ripening fruits should, therefore, be carefully graded for size and quality, handled, and packed with great care, and nothing but choice fruit sent to market. If this is done, a good price will be secured, but if the whole crop—good,

bad, and indifferent—is rushed on to the local markets, a serious congestion is bound to take place and large quantities will go to waste.

Orchards and vineyards must be kept in a state of perfect tilth, especially if the weather is dry, so as to retain the moisture necessary for the development of the later ripening fruits. Where citrus fruits are grown, an irrigation should be given during the month if water is available for this purpose, excepting, of course, there is a good fall of rain sufficient to provide an ample supply of moisture.

Codling moth and fruit fly must receive constant attention and be kept under control, otherwise the later-ripening fruits are likely to suffer severely from the depredations of these serious pests.

Grape vines must be carefully attended to and sprayed where necessary for black spot or downy mildew, or sulphured for oidium. Where brown rot makes its appearance, spraying with the potassium or sodium sulphide washes should be carried out. Leaf-eating insects of all kinds can be kept in check by spraying with arsenate of lead.

Farm Notes for December.

Although November is regarded generally as the best period for planting the main maize crop, on account of the tasseling period harmonising later on with the summer rains, December planting may be carried out in districts where early frosts are not prevalent, provided a known quick maturing variety of maize is sown.

To ensure a supply of late autumn and winter feed, dairymen are advised to make successive sowings of maize and sorghums, to be ultimately used either as green feed or in the form of silage. The necessity for such provision cannot be too strongly urged. Farmers who have not had any experience in building an ensilage stack can rest assured that, if they produce a crop for this purpose, information and instruction on the matter will be given on application to the Under Secretary for Agriculture and Stock; also that, whenever possible, the services of an instructor will be made available for carrying out a demonstration in ensilage-making for the benefit of the farmer concerned and his immediate neighbours.

In districts and localities where supplies of lucerne are not available, sowings of cowpeas should be made, particularly by dairymen, as the lack of protein-yielding foods for milch cows is a common cause of diminished milk supplies and of unthriftiness of animals in dairy herds. Cowpeas and lucerne can be depended upon to supply the deficiency. The former crop is hardy and drought-resisting. When plants are to be used as fodder, it is customary to commence to feed them to stock when the pods have formed. Animals are not fond of cowpeas in a fresh, green state, consequently the plants should be cut a day or two before use. Economy is effected by chaffing beforehand, but the plants can also be fed whole. Chaffed in the manner indicated, and fed in conjunction with green maize, or sorghum, when in head, in the proportion of one-third of the former to two-thirds of the latter, a well-balanced ration is obtainable. Animals with access to grass land will consume from 40 to 50 lb. per head per day; a good increase in the milk flow is promoted by this succulent diet. The plant has other excellent attributes as a soil renovator. Pig-raisers will find it invaluable also.

A great variety of quick-growing catch crops, suitable for green fodder and ensilage purposes, may also be sown this month, notably Sudan grass, white panicum, giant panicum (liberty millet), Japanese millet, red and white French millet. Well prepared land, however, is required for crops of this description, which make their growth within a very limited period of time. French millet is particularly valuable as a birdseed crop, the white variety being more in favour for this purpose.

Successive sowings may be made of pumpkins, melons, and plants of this description.

In districts where onions are grown, these will now be ready for harvesting. If attention is given, in the case of garden plots, to bending over the tops of the onions, maturity of the crop is hastened. Evidence will be shown of the natural ripening-off process, and steps should be taken to lift the bulbs and to place them in windrows until the tops are dry enough to twist off. If a ready market is not available, and it is decided to hold over the onions for a time, special care should be taken in handling. Storage in racks in a cool barn is necessary; otherwise considerable deterioration is to be expected. Improved prices are to be looked for in marketing by grading and classifying produce of this description.

Cotton areas which were subjected to a thorough initial preparation, thereby conserving a sufficiency of moisture for the young plants, should now be making good headway and sending their taproots well down. Keep down all weed growth by scarifying as long as the growth will admit of horse work.

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY D. EGLINTON, F.R.A.S., AND A. C. EGLINTON.

TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

	November, 1930.		December, 1930.		MOONRISE. Nov. 1930.	MOONRISE. Dec. 1930.
Date.	Rises.	Sets.	Rises.	Sets.	Rises.	Rises.
					p.m.	p.m.
1	5.5	6.7	4.52	6.30	1.31	1.55
2	5.4	6.7	4.52	6.30	2.25	2.53
3	5.4	6.8	4.52	6.31	3.17	3.51
4	5.3	6.8	4.53	6.32	4.11	4.52
5	5.2	6.9	4.53	6.33	5.16	5.57
6	5.2	6.10	4.53	6.34	6.16	7.0
7	5.1	6.10	4.53	6.34	7.8	8.5
8	5.1	6.11	4.53	6.35	8.11	9·6
9	5.0	6.12	4.53	6.35	9.13	10.1
10	4.59	6.13	4.54	6.36	10.15	10.47
11	4.59	6.14	4.54	6.37	11.13	11.26
12	4.58	6.15	4.54	6.38	...	...
					a.m.	a.m.
13	4.58	6.16	4.54	6.38	12.5	12.1
14	4.57	6.16	4.54	6.39	12.49	12.35
15	4.57	6.17	4.54	6.39	1.25	1.8
16	4.56	6.18	4.55	6.40	2.0	1.40
17	4.56	6.19	4.55	6.40	2.32	2.16
18	4.56	6.20	4.56	6.41	3.6	2.55
19	4 55	6.21	4.56	6.41	3.40	3.40
20	4.55	6.22	4.57	6.42	4.18	4.32
21	4.55	6.23	4.57	6.43	5.0	5.27
22	4.54	6.23	4.58	6.43	5.48	6.23
23	4.54	6.24	4 58	6.44	6.43	7.20
24	4.53	6.25	4.59	6.44	7.40	8.15
25	4.53	6.25	4.59	6.45	8.35	9.12
26	4.53	6.26	5.0	6.45	9.31	10.4
27	4.53	6.27	5.0	6.46	10.27	10.57
28	4.52	6.27	5.1	6.46	11.22	11.49
29	4.52	6.28	5.1	6.46	12.15	12.41
30	4 52	6.29	5.2	6.47	1.7	1.36
31	...	...	5.3	6.47	...	2.34

Phases of the Moon, Occultations, &c.

4 Nov.	○	Full Moon	8 28 p.m.
13 ,,	☽	Last Quarter	10 27 p.m.
20 ,,	●	New Moon	8 21 p.m.
28 ,,	☾	First Quarter	4 18 p.m.

Perigee, 15th November, at 4.30 p.m.
Apogee, 28th November, at 8.54 a.m.

Mars will, technically, be in conjunction with the Moon on the 13th at 3 a.m., when nearly due north-east; in reality it will appear to be 3 degrees (six diameters of the Moon), to the south of it.

As the Sun will seem to be passing through the constellation Libra in November, reaching Alpha on the 4th, this constellation will be above the horizon all day and not noticeable except in the case of a few of its stars in the west after sunset early in the month. During the last week in November some of the stars in the northern part of Scorpio will be nearest to the Sun.

The grouping of the Moon, Venus and Mercury, nearly in a line with the Sun on the 20th, will be invisible, but should be noted.

Venus will set at 8.29 p.m. on the 1st, and at 7.16 p.m. on the 15th.

Mars will rise at 12.29 a.m. on the 1st, and at 11.57 p.m. on the 15th.

Jupiter will rise at 11.30 p.m. on the 1st and at 10.36 p.m. on the 15th.

Saturn will set at 10.33 p.m. on the 1st and at 9.44 p.m. on the 15th.

About 46 degrees southward of the Sun the Southern Cross will be up all day and getting so near the southern horizon at 8 p.m. as to be invisible.

6 Dec.	○	Full Moon	10 40 a.m.
13 ,,	☽	Last Quarter	6 7 a.m.
20 ,,	●	New Moon	11 24 a.m.
28 ,,	☾	First Quarter	1 59 p.m.

Perigee, 10th December, at 11.42 a.m.
Apogee, 26th December, at 5.48 a.m.

The occultation of the fine star Beta Tauri about one hour after midnight on the 6th instant will be noticeable at all places south of Townsville, north of which the star will be seen below the northern edge of the Moon. This should form an interesting occurrence for all observers with telescopes, field-glasses, or even small binoculars.

When Jupiter and the Moon rise together on the 8th, soon after 9 p.m., the planet will be only 5 degrees distant from the Moon on its southern side. The Moon, being full only two days before, will be too bright for observers to see the stars of Gemini in its immediate neighbourhood.

Jupiter will be apparently very near the place now occupied by the ninth planet Pluto.

The apparently near approach of the quickly moving planet Mercury to slow and stately Saturn will culminate on the 15th, when Mercury will be only 2½ degrees from the bigger planet on its northern side. They will be well situated for observation after sunset, the planets being about 22 degrees above the horizon at that time.

For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S., add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhat about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

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QUEENSLAND AGRICULTURAL JOURNAL

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Event and Comment.

The Current Issue.

ANOTHER instalment of his interesting review of the development of sugar-growing in Queensland is supplied by Mr. Easterby. Brown Spot of the passion fruit vine is the subject of a very useful and well illustrated paper by Mr. Simmonds. Field trials of citrus fruits in Southern and Central Queensland are described by Mr. Prest. Mr. Roberts has a brief note on the poultry mite infesting dwellings. Milk and cream testing are discussed by officers of the Dairy Branch for the benefit of the young farmer. Mr. Carew continues his notes on farmers' sheep and wool. Renewed interest in the possibilities of increasing Australian trade with Eastern Asia is stimulated by Colonel Evans's observations in the course of a recent visit to Manchuria, which are continued in the current number. Other features, including general working notes, make up a good December Journal.

Diseases in Stock.

OPPORTUNITY was taken in the measure now before the State House to include many amendments to the Diseases in Stock Act, which were not considered necessary previously. Power will now be given to restrict the movements of suspected stock, to prescribe the routes by which they may travel, to prohibit clean stock from travelling over a suspected route, to declare roads to be stock routes, and to declare any part of the State an infected area. Quarantine areas may also be declared, and provision is made for the destruction of infected stock, with due arrangements for compensation, under prescribed conditions. The Minister for Agriculture and Stock (Mr. Harry F. Walker), who introduced the measure, said, in moving its second reading, that the Government is negotiating with the Commonwealth Council for Scientific and Industrial Research with a view to treating many diseases in stock from an Australian point of view—that is, to eliminate overlapping in many experiments that are being carried out to-day. Queensland is singularly free from most

of the major stock diseases, and is one of the healthiest stock countries in the world. The Government realises the great importance of keeping it so, and every precaution is taken against the introduction of pests and diseases. In keeping our stock free from disease, it is generally admitted that we have done remarkably well, and the progress made in these matters over the last thirty years has been very sound. There is, of course, always room for improvement, and the present measure is in keeping with our general advance in veterinary science.

Yeerongpilly Stock Experiment Station.

DESCRIBING the work of the Yeerongpilly Stock Experiment Station, Mr. Walker, in the course of his speech in Parliament, gave the following summary of its operations for the twelve months ended 30th October last:—

The work included the immunisation of 221 stud animals against tick fever, with only two mortalities.

Twenty-four specially prepared ''bleeders'' were sold to stockowners, each of which, before sale, was subjected to the tuberculin test and immunised against blackleg.

Three thousand eight hundred and ninety-three doses of recovered tick fever blood were supplied for the inoculation of station and other cattle.

Approximately 1,000 specimens were submitted for bacteriological examination. These included milk, pathological blood, water, cream, pleuro virus, cheese, and butter.

One hundred and ninety-two pleuro cultures of lactic acid bacteria were supplied to cheese factories.

Contagious mammitis vaccine was prepared and distributed sufficiently for the treatment of 9,489 cows.

Three thousand and eighty-five doses of blackleg vaccine were sold and 418 tubes of glucose agar.

Eighty-seven thousand six hundred and sixty-eight doses of natural pleuro virus and 31,275 sterilised setons were supplied to stockowners.

In addition, many bacteriological examinations were made in connection with poultry diseases.

Investigational work included:—

Testing the effects of feeding healthy pigs with milk from a cow known to be affected with tubercular mammitis.

Testing the resistance of tubercle bacilli during the curing process (salting and smoking) of bacon.

Testing the practicability of vaccine treatments for affections of the udder caused by staphylococci and gas-producing bacteria.

Investigations as to the nature and cause of what is popularly spoken of as soft bacon.

Special attention was directed to the preparation of a standardised blackleg vaccine put up in pill form.

The bacteriological examination of samples of water to determine their suitability or otherwise for butter-washing and general factory purposes.

Banana Marketing.

THE Minister for Agriculture and Stock (Mr. H. F. Walker) informed the Press recently that in passing through Sydney to the Wheat Conference at Canberra he had taken the opportunity to make some inquiry as to the condition in which bananas from Queensland were arriving on the Southern market, particularly in respect of the quality of the fruit and the manner in which it was being packed and graded and grade-marked by the growers. The design of the rooms for maturing bananas and the facilities provided and methods adopted for the controlling of the temperatures in these rooms were also made a subject of inquiry by the Minister.

In respect of the quality of the fruit supplied to the market by Queensland, it was found that a large proportion of the fruit was well up to standard, and that some growers were consigning fruit of especially high merit. On the other hand, there was a percentage of growers marketing fruit below standard, which was reacting to the detriment of the industry. Far too many growers were grade-marking their fruit from one to two grade classifications higher than was warranted. This practice had recently been officially brought under his notice, and he intended to take suitable action in the matter, but before doing so he had decided to make inspection and inquiry personally. This he had now done, and had found that there is justification for the complaint. In the interests of the industry, it is essential that the grade mark applied to the package containing bananas shall indicate accurately the grade of fruit packed in each case. Growers defaulting in this direction will be called upon to amend their methods.

The confidence of buyers must be retained if it is desired to hold the Southern market. Queensland growers must more fully recognise this fact, and, in addition, appreciate that New South Wales is at present growing bananas on a scale equal to that of the period precedent to Bunchy Top infestation, and the estimate is that there will be a further 2,000 acres planted under bananas in New South Wales within the next twelve months. That State has banana grade regulations in operation, and Queensland growers should remember this and recognise that the same degree of leniency that has existed in the past will not be continued now that the local production has been increased. The authorities are exhibiting restiveness in the matter of incorrect grade-marking of the fruit grown locally, and it is anticipated that certain definite action will be taken in the matter in the near future, and it would be somewhat remarkable if the defaulting growers in Queensland should escape attention at their hands. He appealed to the growers here to put their house in order without delay.

It was pleasing to note the material improvement that had been effected in the ripening chambers utilised by the more progressive merchants. The improved facilities provided for the maturing bananas will be of great benefit to the industry. He felt confident that there will be an extension in the installation of modern machinery and equipment in the maturing chambers.

Queensland Flora.

THE Bill for the preservation of native flora, introduced by the Minister for Agriculture and Stock (Mr. Harry F. Walker) and which is now before Parliament, has been received with general acclaim. Every thoughtful citizen is heart and soul with the Minister in his determination to provide every possible safeguard for what was described by Professor Goddard of the Queensland University, in a recent public address, as our natural monuments. The flora of Australia, and especially that of Queensland, is unique and of great scientific value, and also, in some instances, of high commercial value. Assisted by her isolation from other land system of the globe, Australia has developed a distinct flora of her own, and through wholesale spoliation many of our valuable plant specimens are in danger of extinction. The flora of this continent concerns the world in general, and we may be regarded only as trustees of the floral wealth with which it abounds. Unfortunately, much of our natural beauty has already been destroyed, and this measure is designed to check a thoughtless or selfish tendency towards wanton spoliation and a spirit of wastefulness and destruction. Our native flora has a really national significance, and in our exploitation or wilful destruction of indigenous plants, æsthetically or commercially valuable, we have allowed our national pride and thoughts for the needs and pleasures of future generations to be overcome. There is always a danger in interfering unwisely with natural features, the value of which is too seldom realised or even thought of. We all know of numerous instances of individual vandalism—and even organised vandalism—through which posterity has been robbed of its undoubted right to enjoy the beautiful things of nature in a country which, from a scientific point of view, is unique in its vegetation and bird and animal life. In all these things we hold a trust, not only for our people, but for the world at large.

THE QUEENSLAND SUGAR INDUSTRY.

By H. T. EASTERBY, Director of the Bureau of Sugar Experiment Stations.

PART XII.

(c) Mills and Milling Work—*continued.*

IN the last instalment of this series it was stated that there were fifteen vacuum pans in Queensland. An engraving of one of these early pans has been kindly supplied by Mr. W. G. Gibson, of Bingera Plantation, and is shown below:—

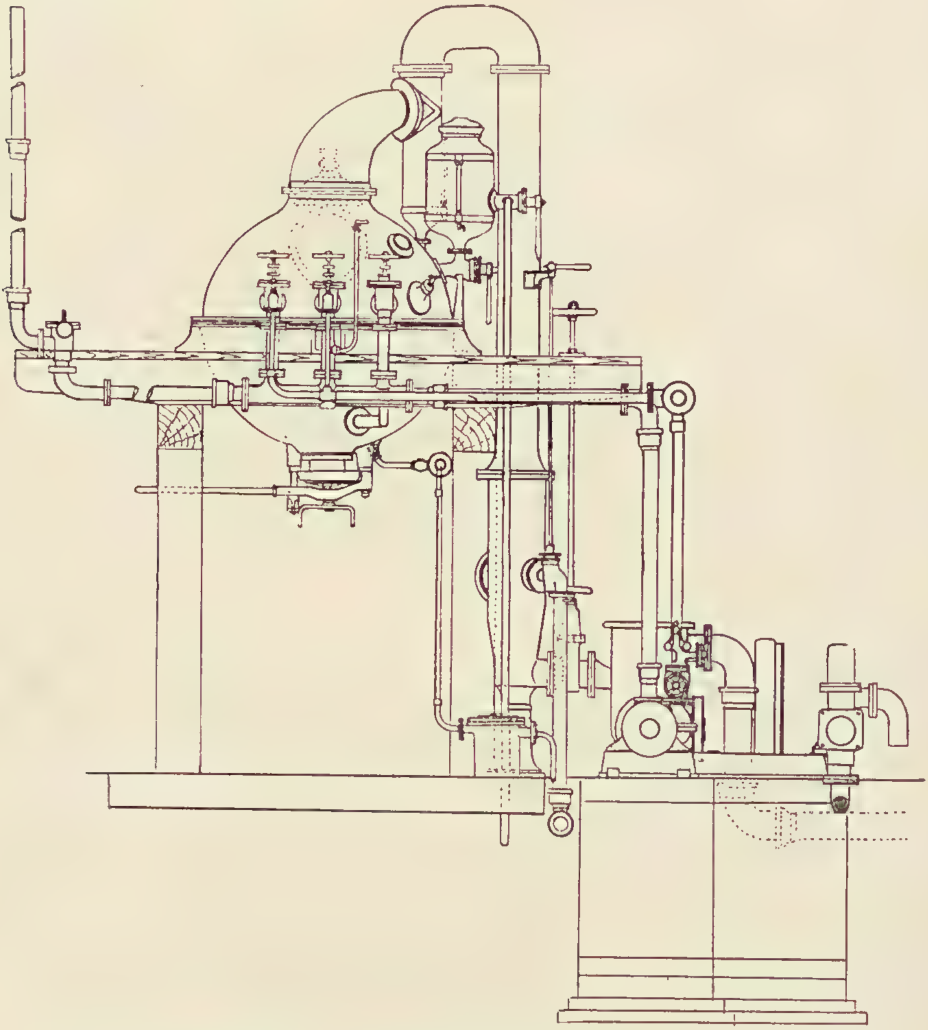

PLATE 173.—EARLY TYPE OF VACUUM PAN USED IN QUEENSLAND SUGAR MILLS.

This pan was made by Mirlees Tate and Watson, of Glasgow, for Messrs. W. Gibson and Sons' Clydesdale Mill, Hemmant, in 1878. It was entirely of copper except that the outside jacket was cast iron. The pan was 5 feet 6 inches in diameter by 5 feet deep, and had a capacity of 1½ ton of sugar. It was used till about 1886 and then transferred to the Rocky Point Mill. I understand it was scrapped about 1921.

In 1880 there were stated to be eighty-three sugar-mills in Queensland as under:—

Cardwell District	2
Mackay District	16
Maryborough and Bundaberg	23
Brisbane District	19
Logan District	23
	83

The production in Queensland that year was reported to be some 15,000 tons of sugar.

Historical facts in relation to the industry between 1880 and 1900 are difficult to secure. During the first decade there was no paper published entirely in the interests of sugar-growing. However, this period of twenty years was one of great development, and a large number of sugar-mills were established, principally in the Bundaberg and Mackay districts.

It was during the eighties that the first two Central Mills—i.e., Racecourse and North Eton—were erected, and it was, unfortunately, during this period that the bottom fell out of the sugar market, due to the rapid development of the European beet industry, and this rival to cane kept the price of sugar low for many years. The introduction of Central or farmers' mills into Queensland, however, was a big step forward and laid the foundation of the subsequent "White Australia" policy. The following extract taken from a booklet published in 1925 on the History of the Racecourse Mill at Mackay is of much interest:—

> "To the Racecourse Central Sugar Company Limited stands the undoubted distinction of having erected the first Central Mill to crush cane in Australia, and thus laying the foundation of the movement that finally wrested the industry from the hands of the black man. . . . prior to the formation of the company the industry was entirely in the hands of private enterprise, the capital being mainly supplied from England. Black labour in the form of Kanakas secured from the South Sea Islands was used in the fields, and (with the exception of a few technical occupations) in the mills."

When the question of farmers' mills was first mooted, there were thirty-one private mills in operation, sixteen on the north side and fifteen on the south side of the river, in the Mackay district.

The initiation of sugar-growing in the Lower Burdekin or Ayr district was said to be in 1879, though a mill was not erected till 1884 on Airdmillan Estate. Seaforth Estate and mill commenced operations in 1884; Kalamia, Drynie, and Pioneer also started crushing about this time.

The late John Drysdale, popularly known as the "Grand Old Man" of the Lower Burdekin district, arrived in Ayr in 1887, and he took a leading part in the development of sugar-milling and field work. He was a member of the firm of Drysdale Brothers. The mill they were so long associated with was the Pioneer, which was built by Spiller and Brandon, of Mackay, but before the mill commenced operations they sold out to Drysdale Brothers, and this mill also commenced crushing

in 1884. Before the arrival of Mr. John Drysdale the operations were carried out by Mr. George Drysdale. The irrigation system laid down by the latter was greatly improved on and extended by John Drysdale, who had been trained as an engineer. He was responsible for many of the improvements carried out in the Ayr district, which owes a heavy debt of gratitude to him. Later, he was responsible for the erection of the fine, up-to-date plant at Inkerman, on the south side of the Lower Burdekin River, and which has done so much to create a large settlement of contented sugar-farmers. His memory is perpetuated by a fine clock-tower in the main street of Ayr.

Owing to pressure of work this part is a very short one. In my next article I hope to be able to supply some further information of the earlier mills.

[TO BE CONTINUED.]

Bureau of Sugar Experiment Stations.

CANE PESTS AND DISEASES.

The Director of the Bureau of Sugar Experiment Stations, Mr. H. T. Easterby, has received the following notes for publication from the Assistant Entomologist at Bundaberg, Mr. R. W. Mungomery:—

FUMIGATION FOR CANE GRUBS.

At the present time and for the next few months cane grubs will be actively engaged eating the roots of the cane stools, and when sufficient numbers are present, their attack usually results in the total failure of the cane in the areas they infest. Several species of root grubs are involved in this destruction, but they are all alike in their ultimate effects on the plant, and, indeed, their habits are very similar. "Frenchi" grubs, however, have a more definite period of inactivity during the winter than some of the other common grubs, and when they resume feeding after this dormant period, they feed very ravenously, causing great damage to the cane, which, by its wilting and yellowing, soon shows unmistakable signs of their presence.

All of these cane grubs can be destroyed by soil fumigation, and this practice offers one of the best ways of dealing effectively with comparatively small outbreaks. By cleaning up small patches in otherwise even blocks of cane, not only may the cane be saved, but a check is placed on the increase of the pest. Young plant cane, by reason of the fact that these fumigants produce a severe wilting effect on cane at such an early stage of its growth, cannot be so treated, and it is essential that the land should, first of all, be thoroughly freed from grubs prior to being planted with cane. Grubs in old ratoons are best dealt with by ploughing out and hand-picking, and as a further aid in this connection, the rotary cultivator will be found very serviceable. This implement, with its revolving knives, cuts up the stools into small pieces, so that many grubs are either killed by it or they are more easily exposed by the ploughs, which later follow on this system of cultivation.

For grub attack in older plant cane or first ratoon cane, soil fumigation offers a remedy, and in order that supplies of fumigants may be on hand the moment grub damage first becomes apparent, the Bundaberg District Canegrowers' Executive has purchased a supply of fumigants, which are to be made available to growers at cost price. By careful experimenting we have found that a mixture of carbon bisulphide and liquid dichlorbenzene in the proportion of two of the former to one of the latter, has given a high percentage of deaths when injected into the soil to kill cane grubs, and this mixture is being made available to growers at £2 per 5-gallon drum. Injectors will also be loaned out at a nominal charge. These injectors deliver measured doses of fumigant into the ground, the usual practice being to inject the dose at a depth of 4 inches. The resulting fumes, which quickly penetrate the soil, soon over-power all insect life that comes within its effective radius. Two injections —one on each side of the stool, are generally given to normal-sized stools, but for

large spreading stools three or four injections may be necessary. For further particulars, growers are requested to call at, or 'phone, the Sugar Experiment Station, Bundaberg, where full particulars of these fumigants and the method of applying them will be given.

SUGAR YIELD.

The Director of Sugar Experiment Stations states that the yield of sugar in Queensland from the present crop is anticipated to be about 508,000 tons of raw sugar of 94 net titre. This will, if realised, be about 10,000 tons below last season. The export of sugar, it is anticipated, will be higher this year owing to decreased consumption in Australia. The cane crop is also lower than last year, and this is due to the dry period late last year and early in the present year.

CANE CROP PROSPECTS.

The Director of Sugar Experiment Stations, Mr. H. T. Easterby, has returned to Brisbane after visiting the sugar districts between Mackay and Cairns. The present crushing is proceeding satisfactorily without any labour or shipping difficulties, and at many of the mills the sugar is being cleared as quickly as it is manufactured. The prospects for the coming season are exceptionally bright, due to the recent splendid rainfalls in the Northern canegrowing areas.

The young cane was looking vigorous and healthy in all the sugar districts from Mackay northwards, and splendid crops are in sight for next season. The rainfall at Innisfail up to the end of October reached 150 inches, while at Babinda the amount registered was 186 inches. Most of this, however, has fallen since the beginning of April. Due to the earlier dry weather in February and March the crops from Ingham to Cairns are not quite so good as was originally expected. On the other hand, the sugar yield at Mackay this year will be better than was anticipated in June, as the commercial cane sugar in the cane is remarkably high in this district, and also at Proserpine.

It is anticipated that, due to the amount of rain that has fallen in the more Northern cane areas, an earlier emergence of the grub pest will be in evidence.

The Bureau hope to furnish an estimate of the present sugar crop within the next few days.

PLATE 174.—SURPRISE CREEK, WINTON. A FAVOURITE PICNIC SPOT.

BROWN SPOT OF THE PASSION VINE.

By J. H. SIMMONDS, M.Sc., Plant Pathologist.

Introduction.

THE value of the passion fruit crop to Queensland is relatively small as compared with other classes of fruit. The crop nevertheless forms a very important adjunct to the establishment of young citrus orchards in some districts, and is commonly grown in connection with certain types of mixed farming. Although possibly justified from the commercial aspect, there are few instances where passion fruit are planted as a main crop. Moreover, an examination of the figures for the acreage under passion vines for the past few years discloses little increase in the area devoted to this fruit. This situation is to a large extent due to the reputation for uncertainty held by this crop, this uncertainty being due to the serious and sudden outbreaks of disease to which the passion fruit is liable.

As little definite knowledge was available concerning these epidemics, and still less concerning their satisfactory control, investigations were commenced in 1926 and have been continued at somewhat disjointed intervals since then.

It has been found that most of the loss may be attributed to one or more of four distinct diseases. These are: (1) Brown spot, a fungus disease caused by a species of *Macrosporium;* (2) powdery spot and fruit scab, with which is associated a *Cladosporium sp.;* (3) a crown rot, the definite cause of which is at present in doubt so far as Queensland is concerned, but which closely resembles a disease occurring in New South Wales, where it is attributed to the action of *Fusarium sp.;* (4) woodiness, a disease of the virus type. Of these diseases, by far the most serious in Queensland is brown spot. The disease, powdery leaf spot and scab, is mainly restricted in its occurrence to the cooler months, and attacks only the young growth and fruit. Crown rot may at times be responsible for considerable loss, but as this disease appears to be to a certain extent dependent on other contributory conditions, such as poor cultivation, the presence of brown spot, &c., for its serious development, it is not held to be of great primary importance. Woodiness, which is of major importance in New South Wales, is fortunately not to the same extent prevalent in Queensland. Possibly the temperature factor stressed by Noble[7] in a recent paper dealing with the disease is to some extent responsible for this freedom. Several other leaf and fruit troubles may at times appear, but in comparison with those previously mentioned they are of a minor nature and rarely cause loss of any economic significance. The disease, brown spot, will now be considered in more detail.

Symptoms.

Brown spot may attack all aerial portions of the vine, and the symptoms displayed are usually quite characteristic of the disease. On the leaves the first symptoms consist of a minute brown dot which enlarges to a more or less circular spot 2 to 3 mm. in diameter and often possessing in the early stages a suggestion of translucency. The spots may shortly show a differentiation into a lighter central area or may retain a uniform shade of dark chocolate brown (Plate 175). When suitable moisture conditions obtain, such as during periods of wet weather, a spot may further enlarge, and there appears a definite water-soaked margin to the old spot limits. The different stages of growth

Plate 175.
Brown spot on leaves of the passion vine (*P. edulis*).

later become evident in a faint concentric ridging, and in a variegation of the shades of brown—the darkest being towards the margin, while the central region is often not more than a light grey. Older spots may attain a diameter of 1 to 2 cm., and may be rounded or angular in shape.

The spores of the fungus causing the disease may often be seen forming a fine, dusky coating over older spots usually more abundant on the lower surface.

Fruit appear to be most commonly attacked from the time they are about half-grown until almost ready to colour. The lesion appears first as a minute dark-green water-soaked spot with an almost indistinguishable light-brown speck in the centre. The light-brown centre gradually enlarges to form a more or less circular area of uniform brown, sometimes retaining the water-soaked region as a narrow dark-green border. When over 2 mm. in diameter the spot usually becomes somewhat sunken, and after reaching about 2 cm. the marginal tissue becomes wrinkled and contracted (Plates 176, 178). Unless invaded by secondary organisms the spot remains firm and the fruit shrivel up without presenting a wet rot.

On the branches the lesion commonly takes the form of a dark-brown area extending 2 to 4 cm. or more up and down the runner. This affected area is, in the majority of cases, associated with the leaf axils and is usually at first confined to that side of the runner from which the tendril and leaf is given off (Plate 177). Eventually complete circling and consequent cincturing may take place. As the lesion ages it becomes greyish brown in colour and often bears a sooty mass of Macrosporium spores as well as pustules of various saprophytic fungi.

Effect of the Disease on the Vine.

The effect of brown spot on passion fruit culture is twofold. There is the indirect loss occasioned by the reduction of foliage and runner, and the direct loss, when the fruit are attacked.

A characteristic feature of the disease is the rapidity with which abscission of the leaves takes place when these are affected. The presence of the fungus in even a single lesion is sufficient to cause a leaf to fall shortly after the appearance of the spot—in many, if not the majority of cases before spore formation has commenced. The result of a severe outbreak is to leave the vines practically devoid of foliage and consisting merely of an interlaced network of bare runners (Plates 182, 183). Although the runners, unless themselves attacked, will often come away again, this defoliation will cause a set-back of several months duration. Young buds also fall readily if they become spotted, and much loss may be occasioned should the disease be prevalent during the flowering stage.

Probably the greatest damage is done when the runners themselves are attacked. The leaves and fruit on several feet of runner may suddenly wilt and wither. On tracing back the affected branch there will usually be found a brown spot lesion which has worked round and through the runner until the distal portion is completely cut off from the main vine. It is doubtful whether the older runners are ever infected directly, but there is evidence to suggest that the disease may work in from an infected young lateral and eventually cincture the larger branch. This cincturing is not necessarily a quick process, and its effect may show up in the spasmodic wilting of individual runners long after the actual infection took place. For this reason the origin of the wilting is often puzzling to some growers.

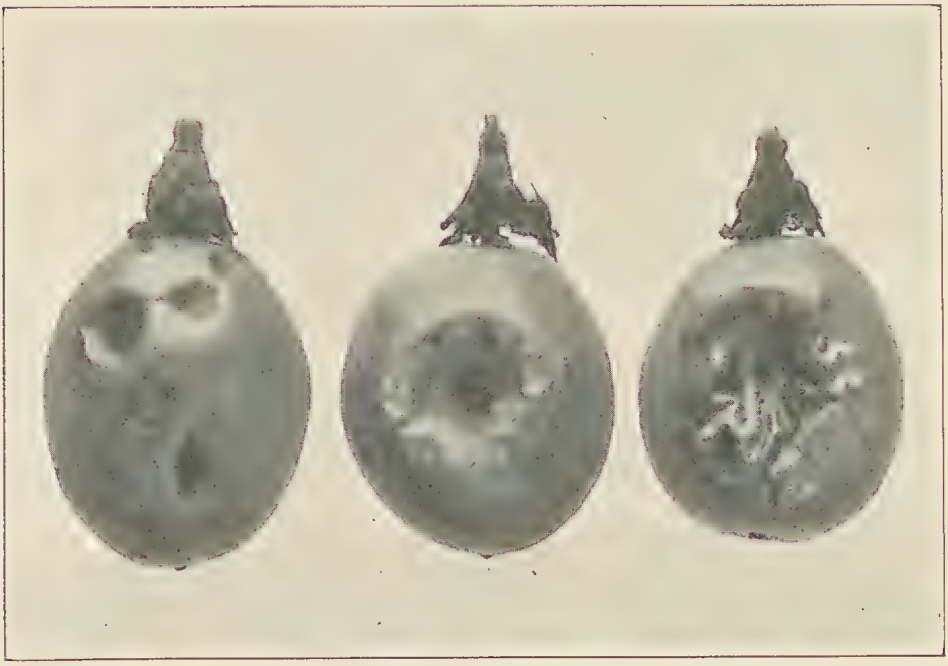

PLATE 176.
Brown spot on passion fruit.

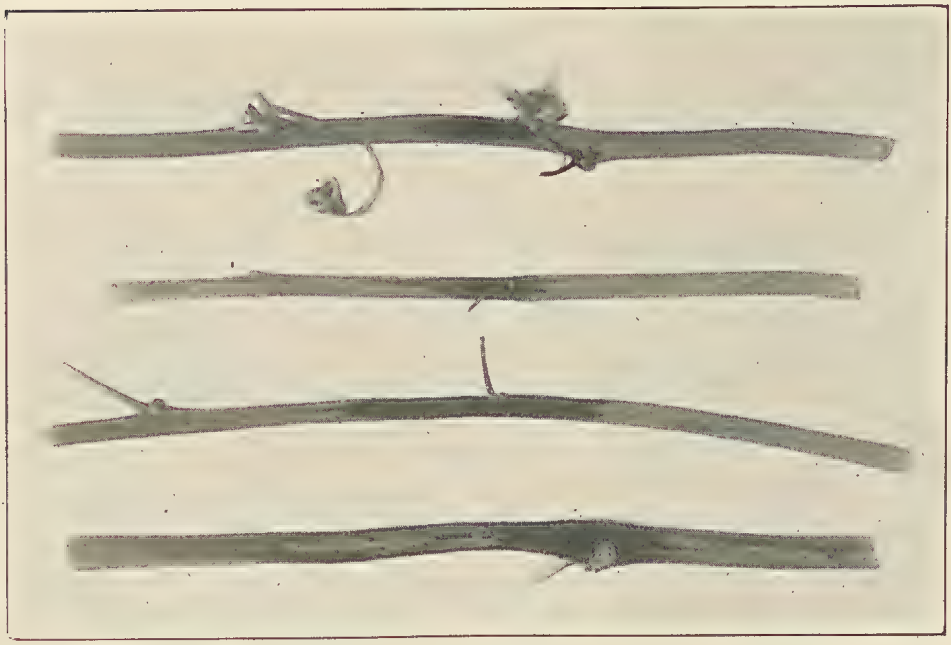

PLATE 177.

Brown spot lesions on the stem of the passion vine. The upper specimen shows infection commencing both at the leaf axil and apart. The lower illustrates complete cincturing.

The combined result of a severe attack of brown spot is to cut back the vine to the main stems. New shoots may be produced from these during the next season, but in the meantime valuable intermediate crops are lost. Often the vine will not recover and whole plantings have been destroyed by this means under conditions favourable to the development of the fungus.

An important factor augmenting the seriousness of brown spot is that the set-back given by a bad attack often appears to be able to upset the balance sufficiently to enable collar rot to gain the ascendancy and completely kill a vine. A healthy and vigorous vine is usually able to form new tissue in pace with the invasion of the rot so that little actual damage results.

Fruit bearing small spots may be marketable for pulping purposes as the pulp is usually unaffected in these cases. Fruit bearing larger lesions are of course valueless. The loss occasioned in this way may be considerable as may be judged by a count made on coloured and colouring fruit from two short rows. This showed that out of 317 fruit 228 or 72 per cent. were affected with brown spot.

Under ordinary plantation conditions the severity with which a vine is attacked by brown spot is usually found to be directly related to its age. Vines up to two years old usually do not suffer to a great extent, but from then on the older the vine the more severely is it attacked. After an epidemic it is often a simple matter to pick out the relative age of the rows from the state of the vines. This is not considered to be due to a loss of resistance but to the great increase in the mass of foliage and vine in the older plants. Pruned vines exhibit no increase in susceptibility with age.

Distribution.

Brown spot appears to be distributed throughout South-eastern Queensland, and as a consequence the more important passion fruit producing centres have the disease well in evidence. The most northern limit from which brown spot has been recorded is the district of Waterloo, 230 miles North of Brisbane. As will be seen later there is evidence that an allied form of the disease exists further north, the granadilla being the sufferer in this case.

The origin of brown spot in Queensland is obscure. The first authentic record of its occurrence was made by Tryon[2] in 1912, and the disease was evidently already well established at that time.

It is interesting to point out in this connection that while this disease has been found affecting under natural conditions three other introduced South American species of *Passiflora* none of the native species is attacked.

History of the Disease.

The first available reference to a disease apparently resembling the one under discussion is to be found in a paper written by Cobb[1] in 1903 in which are discussed certain passion vine diseases of New South Wales. Reference is here made to a fruit spot with which is associated a species of *Macrosporium*. As neither the descriptions of the disease nor the associated organism agree satisfactorily with the facts as they obtain in Queensland, it is not possible to decide definitely on any relationship between the two diseases.

Tryon[2] (1912) in a preliminary report on a disease of the passion vine in the Cleveland district, Queensland, describes symptoms identical with those of brown spot. He attributes the cause of the disease to the presence of a species of *Helminthosporium.* It is, however, probable that in his first naming of the casual organism Tryon was misled by the fact that it is characteristic of the *Macrosporium* found fruiting on brown spot lesions to produce spores with few or no longitudinal septa, as in the Annual Reports for 1917[3] and 1918[4] he refers to a leaf spot caused by a *Macrosporium sp.* allied to *M. cucumerinum.*

In Victoria, Farrol[5] (1923) refers to a disease which from the description and illustrations given closely resembles in its symptoms the brown spot of Queensland. He, however, gives as the casual agent *Glœosporium sp.*

In the leaflets of the Department of Agriculture, New South Wales[6] (1923, 1926), a similar disease is described and attributed to *Glœosporium fructigenum.* Noble[7] (1928) also mention brown spot, caused by the fungus *Glœosporium fructigenum* Berk as being responsible for serious loss in New South Wales.

Cause of Brown Spot in Queensland.

In Queensland all evidence obtained points to the fact that the disease so far as this State is concerned is due, as was first indicated by Tryon, to a species of *Macrosporium.*

Extensive isolations made by single spore and tissue plantings from typical lesions on leaves, fruit and stems, consistently yielded this organism. Typical lesions can readily be obtained on all the above-mentioned parts by inoculation of mycelium taken from pure cultures of the fungus. Ten different strains have yielded positive results in this way. From these lesions the *Macrosporium sp.* can be re-isolated.

Glœosporium pustules are not uncommonly found associated with brown spot lesions, though usually in a position suggesting their presence in a secondary capacity. Inoculations with strains of *Glœosporium* isolated from such associations have in no instance produced typical lesions—the usual result in these cases being little or no development differing from those of the controls.

A species of *Glœosporium* is, however, apparently responsible for a distinct disease. This consists of a leaf spot and a small white stem canker. The former takes the form of an opaque, whitish lesion of from ½ to 2 cm. diameter sharply delimited by the veins of the leaf to a definitely angular shape. A few black Glœosporium pustules may be present on the otherwise uniformly light surface.

Morphological and Cultural Characters of the Causal Organism.

Under suitable natural conditions spores of the *Macrosporium sp.* associated with brown spot are formed on the older leaf, fruit and stem lesions in abundance. In culture spore formation has only been obtained by the special method described by Rands[8] and then only in the case of certain strains. Some considerable difference in spore dimensions appears in measurements made from field material obtained in southern districts and in those obtained from a more northern situation near Bundaberg. Spores obtained in cultures from both places are, however, in close agreement although differing again from those naturally produced. The difference is mainly due to the size of the beak which is greatly reduced in the northern form as compared with the southern and is specially well developed in culture. The dimensions will be found in Table 1.

Plate 178.

Upper: Passion fruit naturally infected with brown spot. Lower: Fruit artificially inoculated with a culture of the *Macrosporium sp.*, from *P. edulis*.

The spores of the passion *Macrosporium sp.* resemble in general appearance those of *M. solani* E. and M. as described by Rosenbaum[9] and as a characteristic have their septation largely restricted to transverse divisions of which there may be 5 to 13 with an average of 8·7. Longitudinal and oblique septa are in many entirely absent, the average being 2·5. Definite muriform septation is rare. The beak is rarely forked in the naturally formed spore, but in culture as many as five branches may be formed with two and three appearing most commonly. The length of the beak is also increased on culture material.

TABLE I.

Spore Measurements of the *Macrosporium* causing Brown Spot of *Passiflora spp.*

Origin.	Number Measured.	Length of Body.		Length of Body plus Beak.		Width.		Number of Transverse Septa.		Number of Longitudinal Septa.	
		Extremes.	Means.	Extremes.	Means.	Extremes.	Means.	Extremes.	Means.	Extremes.	Means.
P. edulis (natural)	80	64–116	87	108–240	168	15–26	20	5–13	8·4	*	2·5
P. *edulis* (culture)	40	66–108	85	186–305	253	18–24	20	6–12	9·1	0–8	2·6
P. *edulis* (northern form, natural)	20	54–102	70	87–150	106	16–27	21	5–10	7·6	0–4	2·6
P. edulis (northern form, culture)	20	69–105	86	191–305	249	18–23	21	8–12	9·6	0–7	2·7
P. alba (natural)	50	60–114	80	96–212	151	14–26	18	5–12	8·3	0–10	1·8
P. quadrangularis (natural) ..	60	44–135	88	92–232	179	14–24	19	6–12	8·7	0–7	1·8
P. foetida (northern form, natural)	35	30–75	46	54–117	71	12–21	16	3–11	6·8	*	3·4

* 0–muriform.

A typical fourteen-day-old culture on potato dextrose agar slope takes the form of a fairly close-growing, light-grey, cottony growth with not usually more than 5 to 6 mm. marginal extension round the glass. Later the surface becomes compacted and smooth. Substratal growth is black. The colour of the media may remain unaltered, or it may change to various shades of brown or occasionally to a deep reddish brown, depending on the strain under observation. Accompanying the darker discolouration of the media there is often an orange or reddish-brown zonation of the mycelium, especially in old cultures.

No perfect stage has been found associated with the *Macrosporium sp.* of brown spot. Such a stage is not deemed necessary for the life history of the organism, as sufficient lesions are present throughout the year to ensure a continuity of spore material. The spores themselves may remain visible for considerable periods, as may be judged from the following figures for longevity taken from material kept in the laboratory:—

Table II.—Longevity of Spores.

Age of Spores.	Per Cent. Germination.
19 months	13
16 ,,	30
2 ,,	72
A few days	100

Temperature Relationships.

On potato dextrose agar the *Macrosporium sp.* has been found to grow readily at temperatures between 20 deg. and 29 deg. Cent. On the lower side growth falls away gradually until it becomes very scanty at temperatures approaching freezing point. Above 30 deg. Cent. growth diminishes rapidly and ceases entirely round 35 deg. Cent. The optimum temperature ranges from 23·5 deg. Cent. to 28·0 deg. Cent. according to the particular strain under observation. So far as can be judged from the limited number of series available, there is no appreciable difference between strains derived from either *P. edulis, P. alba,* or *P. quadrangularis,* three known hosts of the species of *Macrosporium* in question. These relationshipships are illustrated graphically in fig. 1.

Spore germination follows the same general scheme of temperature reaction as does mycelium development.

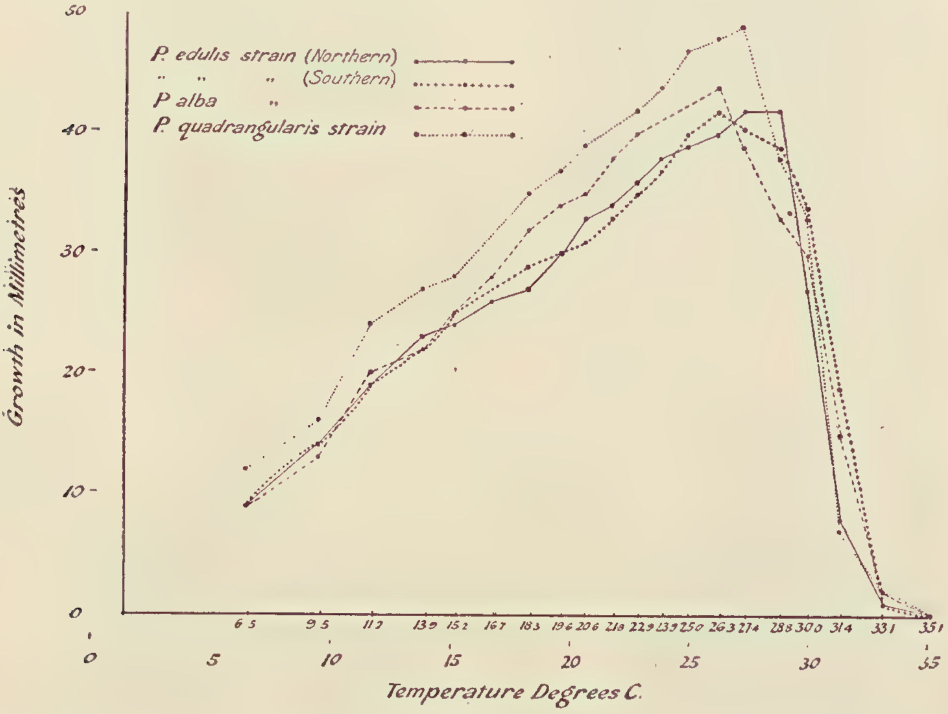

PLATE 179.

Fig. 1.—GROWTH-TEMPERATURE CURVES FOR FOUR STRAINS OF THE *Macrosporium sp.* ASSOCIATED WITH BROWN SPOT. Six days growth on potato dextrose agar at twenty temperatures ranging from 6.5 deg. Cent. to 35.1 deg. Cent.

Seasonal Conditions contributing to Brown Spot Development.

Owing to the fact that seasonal observations of this passion vine disease were necessarily of a somewhat disjointed nature, it is not possible to indicate relationships between weather conditions and brown spot other than in a general manner.

It is possible to find odd leaves affected with brown spot at all times throughout the year. However, the disease is not usually present to any marked extent, except during the period from August to March inclusive.

Plate 180.

Brown spot on the leaf, stem, and fruit of the white passion flower (*P. alba*).

During the other four months rainfall is normally low and the temperature as a rule averages less than 15 deg. Cent., with the result that brown spot is usually of secondary importance to powdery leaf spot and scab. Serious epidemics usually follow a period of several days wet and muggy weather. These conditions are apparently also necessary for abundant spore formation.

The usual course of events is for the disease to gradually increase in prevalence during the spring and early summer months to culminate in a more or less serious defoliation about December and January, the seriousness of the attack being largely determined by the extent and nature of the rainfall during the latter months of the year. Thus, for example, brown spot was not nearly so serious following light spring rains in 1926 and 1928 as in the 1927-1928 summer, when rain towards the latter end of 1927 was abundant. Smaller outbreaks may occur during later summer months but these are not as a rule of such serious consequence.

Varietal Susceptibility.

The common purple passion fruit is highly susceptible to brown spot as may be judged from the remarks already made in this article. The only other variety which is grown to any extent on a commercial scale is the "mammoth" characterised by somewhat larger leaves and fruit. When judged against the plantings of the common vine growing in the same locality this variety appears to be equally susceptible to the disease. Other varieties such as the "yellow" passion fruit and species of *Taxonia* are not grown in sufficient quantities for their relative resistance to be ascertained. The fact that the fungus readily attacks three other species of *Passiflora* would suggest that the chance of obtaining a resistant variety of *P. edulis* is not favourable.

Other Hosts.

(1) The White Passion Flower.

There are to be found in Queensland several species of the genus *Passiflora.* Of these the commonest and closest ally of the common edible passion fruit (*P. edulis* Sims.) is the white passion flower (*P. alba* Link and Otto), a Brazilian plant which is commonly to be found in the naturalised state throughout coastal Queensland. This plant is usually to be found on the edges of scrub clearings and is particularly abundant at Tamborine Mountain.

The white passion flower is commonly found affected with a fungus disease whose general appearance suggests a similarity to the brown spot under discussion. Lesions are produced on leaf, stem, and fruit, identical with those found on the edible passion, with the exception that on *P. alba,* owing no doubt to some difference in chemical composition, the spots are of a deep purple rather than brown colour. The natural effects, such as leaf fall and stem cincturing, are found as in the case of the cultivated species. Isolations from leaves, fruit, and stem lesions by tissue planting and single spore methods yielded a fungus culturally identical with that obtained from the cultivated vine. Inoculation of six of the *P. alba* strains of *Macrosporium* into *P. edulis* fruit and stem gave positive results in each case. Equally as good development was obtained as when *P. edulis* itself was the origin of the inoculum. The reciprocal inoculation has not been attempted.

The spore characteristics and measurements of the *Macrosporium* obtained from lesions on both species of *Passiflora* are in close agreement (Table 1). The temperature reactions of the two strains are also similar (Fig. 1).

It would therefore appear that the disease on the two hosts is identical. Little difference can be noted in the extent of infection in the two plants. It has not been found possible to theorise as to which *Passiflora* species was the original host for the fungus.

Theoretically passion fruit growers should be advised to destroy all plants of the white passion flower growing in the vicinity of their plantations. The condition of the cultivated passion vines themselves on most farms would suggest that such a high percentage of infection must arise from these alone, that the part played by the wild vines is insignificant. Any grower, however, who intends to systematically treat his vines for brown spot should also keep the white passion flower in check as far as possible.

(2) The Granadilla.

The granadilla (*P. quadrangularis* Linn.) is also affected with a fungus disease producing a brown leaf spot and a spot on the fruit. The lesion on the leaf closely resembles the brown spot of the passion vine. On the fruit, which possesses a thick soft rind, there may be produced eventually large pyramidal excavations 2 to 3 cm. in diameter and somewhat less in depth. (Plate 181.)

By using tissue planting and single spore methods there has been obtained from lesions on leaves and fruit of Brisbane-grown granadillas a *Macrosporium* which differed very little, if at all essentially, as regards cultural characters from those strains of *Macrosporium sp.* isolated from *P. edulis* and *P. alba*. The spore characteristics and measurements agree fairly well with those from the latter hosts. (Table 1.) Typical lesions were produced by inoculation of this granadilla strain into passion fruit. Inoculations of the *P. edulis* and *P. quadrangularis* organisms into granadilla fruit were also successful. (Plate 181.)

The granadilla being a more tropical plant than the passion vine, is found more extensively grown in the Northern districts of Queensland. It is there subject to a brown leaf and fruit spot closely resembling in general characters the disease just described from the Brisbane district. However, although a *Macrosporium* was associated with the Northern form of the disease, this organism showed considerable difference culturally and as regards spore measurements from the *Macrosporium* strains described above. Nevertheless, when inoculated into passion fruit, cultures of one of these Northern species produced definite and fairly typical brown spot lesions. Further work is necessary in connection with brown spot as it occurs on the granadilla, but it is considered likely that while the organism obtained from *P. edulis*, *P. alba*, and the Brisbane grown *P. quadrangularis* evidently represent closely allied strains of the one species, the Northern form is possibly distinct.

(3) Passiflora foetida.

More recently there has been noted at Waterloo, a district some 250 miles north of Brisbane, a leaf spot and stem cincturing of the more tropic-loving Passiflora, *P. foetida* Linn. The lesions on this plant were practically identical with those occurring on *P. edulis* and *P. alba;* plants of both of these latter species in the same locality being heavily infested with brown spot.

PLATE 181.

Granadilla inoculated with single spore cultures of the *Macrosporium sp.* from brown spot. Upper: *P. quadrangularis* strain. Right mid and lower: *P. edulis* strain. Left mid: Uninoculated control.

Cultural characters and spore measurements of the *Macrosporium* associated with *P. foetida* lesions present certain differences from those of the organism from the cultivated vine although inoculations proved the *P. foetida* organism capable of producing typical lesions on *P. edulis*. However, it may be pointed out that the spore measurements of the Northern form of the *P. edulis Macrosporium* also present considerable differences from the Southern.

Other species of *Passiflora* growing in Queensland—*P. suberosa* Linn., *P. Herbertiana* Lindl., and *P. aurantia* Forst., the two latter being native species—have not so far been found affected with a disease akin to brown spot. It is interesting to note that *P. Herbertiana* is a probable host for the species of *Cladosporium* associated with the powdery spot and fruit scab of the passion vine, while *P. alba* at times harbours a closely allied strain of this fungus.

Control Experiments.

Experiments designed to effect a control of brown spot and other foliage diseases of the passion vine were commenced towards the latter end of 1926. Suitable vines and facilities for preparing the sprays were kindly placed at the disposal of the Department by Messrs. H. Bishopp and J. Dunlop, of North Tamborine, to whose generous help we are greatly indebted.

PLOT A.—Early in October, 1926, applications of Bordeaux (6:4:40), lime sulphur (1 in 30), Burgundy mixture (6:8:40), and culcal (a copper sulphate-lime dust) were made each to one of four pruned rows of vines.

PLOT B.—The same treatment was applied to each of four unpruned rows.

These eight rows were at the time two and a-half years' old, were 1¼ chains long, and contained six vines. These applications were repeated in November and again in December. Suitable adjacent rows were left as controls.

Little disease developed during the season, and the effectiveness or otherwise of the applications could not be determined. It was subsequently found that the majority of the vines pruned and sprayed with Bordeaux and Burgundy and a few of those treated with lime sulphur were sufficiently improved to enable them to live, whereas the dusted and control rows died out completely twelve months later.

It was shown that no practical result can be expected from spraying an old unpruned vine, as the mass of foliage accumulated effectively prevents efficient covering by the spray. It was also found that the ideal conditions necessary for obtaining satisfactory covering and adherence of a dust on a leaf as shiny as that of the passion vine practically precludes any but the wet method of treatment. Dusting was therefore not attempted in subsequent trials.

1927-28 Season:

The experiments were taken up again towards the end of October, 1927.

PLOT A.—The four rows pruned and treated in 1926 were again pruned, and alternate rows sprayed with Bordeaux 6:4:40 and lime sulphur 1 in 30. That row receiving Burgundy the previous year received Bordeaux on this occasion, and the dusted row received lime sulphur.

PLOT B.—The four rows treated but not pruned in 1926 were cut well back, heavily fertilised, and sprayed as for the first four rows. This treatment proved too severe owing to the poor condition the vines were in at the time, and they subsequently died back to the crown.

PLOT C.—In addition to the above, five rows of younger vines twelve months planted out and each containing eight vines were treated as follows:—

No. 1.—Pruned; fertilised 3 lb. per vine of a mixture containing 4·5 per cent. ammonia, 8·9 per cent. phosphoric acid, and 15·8 per cent. potash; sprayed Bordeaux (6:4:40).

No. 2.—Received the same treatment as row 1 except that lime sulhpur (1 in 30) was substituted for Bordeaux.

No. 3.—Pruned and fertilised only.

No. 4.—Control—untreated.

No. 5.—Pruned only.

No difference was noted with respect to either yield or disease occurrence between the manured and the unmanured vines which were growing in a red basaltic loam, and the manuring was not therefore repeated.

The pruning and first spray application were made on the 26th October, 1927. Six further applications of spray were made during the 1927-1928 season.

Results: PLOT A.—A few months after the time of the first spray application the controls for this plot had died out completely as a result of brown spot and crown rot.

Of the treated rows (pruned and sprayed, and pruned also in 1926) those receiving Bordeaux made good growth which was maintained by similar treatment in subsequent years, until other operations necessitated their removal at the end of 1929. At this time when nearly six years old, these two rows were considered among the most productive on the plantation.

PLOT B.—The treated rows (heavily pruned and sprayed but not pruned the previous year) did not recover from the severe treatment they had received from the disease and the pruning and were of no further use in the experiment.

PLOT C.—Of the five rows of younger vines it was noticed throughout the year that the Bordeaux treated row, and, to a slightly less extent, the one receiving lime sulphur, were comparatively free from brown spot and grey powdery spot. The disease was slightly less effectively controlled on the rows pruned only. The controls at certain periods exhibited considerable brown spot with consequent leaf fall. Serious epidemics were, however, absent during this year of the experiment.

1928-29 Season.

PLOTS A AND C.—Towards the end of September, 1928, the annual pruning took place, followed by the usual spray applications. The various rows received the same treatment as in the previous year. The spraying was repeated six times during the ensuing twelve months at from one to two months intervals. Taken over the whole of this time the results indicated that Bordeaux spray on pruned vines will effectively

PLATE 182.

Three-year old untreated vine from control row of Plot C. Photographed, 12th December, 1929. A mass of defoliated and dead runners, and very few fruit present. *Cf.* Plate 184.

PLATE 183.

Four-year old untreated passion vine. Photographed, 12th December, 1929. Almost complete defoliation and die-back, resulting from brown spot.

control brown spot in all its various manifestations. Lime sulphur is slightly less effective. Pruning alone, while somewhat less successful again, yet gives very fair control and does not allow of the extreme defoliation and runner cincturing met with in the check rows. A count made on one occasion of ripe or colouring summer crop fruit from treated and control rows will illustrate this.

	Sound.	Affected brown spot.
Pruned and sprayed witn Bordeaux	44	2
Pruned and sprayed with lime sulphur	29	5
Pruned only (average two rows)	40	21
Control (average two rows)	44	114

It will be noted that the wastage due to pruning was in this instance almost made up by the increased proportion of healthy fruit borne by the pruned vines. It might appear from these figures that in spite of the disease the untreated control row would be the most commercially successful. However, reference to the yield from subsequent crops usually shows otherwise. Moreover, in a year of severe brown spot incidence, the chance of obtaining any intermediate or even winter crop off any but young vines when untreated is very small.

1929-30 Season.

PLOT A.—The four rows of old vines in this plot representing the original vines experimented with were left unpruned, as it was intended to remove them after the summer crop as the land was needed for other purposes. Spray applications were made in October and December. Ammoniacal copper carbonate replaced Bordeaux in the spraying schedule, as it was desirable to find an effective spray that would not stain the fruit.

Results:—In October the vines, now six years old, were carrying a very heavy summer crop and represented probably the most productive vines in the plantation. It will be remembered that the controls of this series died out two years previously and checks had to be made against other younger, untreated vines in the plantation. However, although sprayed they soon began to show the effects of not having had the usual pruning, and by the end of January were fairly heavily affected with brown spot.

PLOT C.—On 10th October, 1929, the vines of this plot received their annual pruning and spraying as in previous years with the exception that ammoniacal copper carbonate replaced the Bordeaux in row 1. A second spray was given in December, but opportunities were available for making only two further applications during the next six months.

Results:—The pruned and sprayed and the pruned only rows made the usual rapid growth and presented a marked contrast to the check rows throughout the ensuing twelve months, although towards the end of winter the absence of the usual number of spray applications made itself felt to a certain extent.

Plates 185 and 182 give some indication of the condition of the treated and untreated vines of this plot. Plate 184, representative of similar vines treated by Mr. Bishopp, is also interesting in this connection.

A careful record kept by Mr. Bishopp of the marketable fruit obtained from the experimental rows of Plot C for the winter crop

during July and August, 1930, is definitely in favour of the treatment. The counts were made from eight vines in each case.

(1) Pruned plus ammoniacal copper carbonate (Bordeaux previous years)	1,682
(2) Pruned plus lime sulphur	1,409
(4) Check untreated	112
(5) Pruned no spray	.655

Conclusions from Field Experiments.

(1) Brown spot can be effectively controlled by systematic pruning and spraying.

(2) Spraying unpruned vines is ineffective.

(3) Dusting is likely to be of little use in connection with a plant such as the passion vine and under the conditions obtaining where this crop is grown.

(4) Bordeaux mixture was the most efficient of the fungicides used. This spray also appears to have somewhat of a stimulating effect on foliage and fruit production. Care must be taken not to apply Bordeaux during showery weather or severe burning of exposed runners is likely to occur.

(5) Burgundy and ammoniacal copper carbonate are also effective, but have not had a very extensive trial. The latter is probably about on a par with lime sulphur. A spreader can be used with advantage in the copper sprays.

(6) Lime sulphur when used with a casein spreader exhibits a better covering capacity than Bordeaux, but is somewhat less effective in its control of the disease.

(7) Pruning alone has been shown to give very fair control of all ordinary outbreaks of brown spot; in fact, pruning is considered to be the major factor in the control of this disease. So necessary is it considered to be that a special discussion of the merits and demerits of the procedure are given below. Fruit production from vines which have been pruned only does not appear to equal that from vines which have received spray as well.

Pruning.

The effect which pruning has on the control of brown spot can be explained as follows:

(1) Pruning stimulates the vine to healthy, vigorous growth.

(2) The thinning-out process allows a free access of light and air to all parts and prevents the formation of a moisture-holding mass of accumulated runner and foliage. It also enables a spray if such is being applied to reach all parts of the vine.

(3) Old stem cinctures can be removed, and as these are a prolific source of spores the spread of the disease is checked thereby.

(4) Probably the most important influence is due to the fact that infection of a leaf with brown spot usually leads to early abscission.

In the unpruned vines these leaves tend to be caught in the tangled mass of foliage and runner, and it is an easy matter for spores associated with the spots to be washed on to further healthy portions. In a pruned vine, however, it is usual for infected leaves to fall to the ground carrying any spores which may be present to a certain extent out of harms way. In many cases spore formation has not taken place before the leaf falls.

PLATE 184.

Three-year old vine similar to those of Plot C, pruned third week in August, 1930. Sprayed three times (Bordeaux). Photographed, 12th December, 1929. Good summer crop hanging. *Cf.* Plate 182.

PLATE 185.

Three-year old passion vine, from Plot C, pruned and sprayed with ammoniacal copper carbonate on 10th October, 1929. Photographed, 12th December, 1929. Healthy runners in preparation for intermediate crops. Summer crop light on account of late pruning.

It has further been shown that spore formation may take place on brown spot lesions after the leaf has become detached from the stem and even after the leaf has commenced to dry up, thus disclosing an additional source of danger in leaves held in the vine. It is common to find more or less concentrated patches of dead and dying leaves suggesting an origin from a single source such as a spore-bearing leaf remaining in the vine.

It is often observed by growers that passion vines growing wild on the borders of the scrub are affected little by the disease. This can be explained partly by the isolation from sources of infection and also by the fact that a vine growing under these conditions rarely makes a dense growth.

A further advantage to be derived from pruning is found in the stimulus given to fruit production and in the better quality of fruit obtained. It is possible to very considerably increase the quantity obtained from intermediate and winter crops when prices are at their best. Mr. Bishopp estimated that for the intermediate crop harvested in April and May, 1929, the Bordeaux sprayed and pruned rows yielded double the average of his untreated vines. Moreover, the fruit graded out at three firsts to one second, a considerable improvement on the quality of the rest of the plantation. The effect of pruning on the winter crop is shown in the figures given on page 581.

The main arguments against pruning are the time and labour involved, and the fact that it is usually necessary to sacrifice a portion of at least one crop during the pruning process. As regards the sacrificing of a portion of the summer crop, it is usually found that the added return from the off season fruit more than compensates for the previous loss.

It is interesting to note that, according to the records of the Government Statistician, the average annual return per acre over the last ten years for passion fruit was £93, while that per acre of grape vines was £58. Even allowing for some discrepancies in these figures, it still appears possible for the passion grower to devote with advantage more time to pruning and spraying, such time being spent as a matter of course in grape cultivation. In fact it is doubtful whether passion fruit growing will ever be placed on a satisfactory basis until the present haphazard methods give place to ones more comparable to those devoted to the culture of other fruits.

Time of Pruning.

As is pointed out in another section, brown spot usually reaches serious proportions only during the months from September to February, inclusive. Hence to be effective, pruning should take place early in this period. It has been found that by pruning when the summer crop has just commenced to set (usually some time in August in early localties or in September or October in cooler areas) a proportion of the summer crop is sacrificed, but a considerably better yield of intermediate and winter fruits is obtained. By pruning in August before the summer crop has commenced to form, a full summer crop is obtained, but it may be necessary in some districts to lose the latter end of the previous winter crop. When the latter method is adopted, the intermediate and winter crop cannot be expected to be as good as when the pruning is left until later.

By the time winter comes round the vines will be found to have formed a thick growth of leaves and runners, leaving no sign of having previously been heavily cut back. From the disease point of view this growth is not of such serious consequence at this time of the year, as powdery leaf spot is usually the only disease of consequence during the cold months, and to check this a spray needs to be applied principally to the young shoots and fruit on the outside of the vine.

A Warning.

A word of warning is necessary to those growers who have the disease known as woodiness in their plantation. This disease, characterised by the production of small, hard, and usually deformed fruit and a mottled and crinkled condition of the foliage, has recently been shown by Noble[7] to be a disease of the virus type which may be transmitted from a healthy to a diseased vine by mechanical means, such as possibly the pruning knife or even the hand.

Careful examinations of the plantation should therefore be made towards the end of the winter, when woodiness will be showing up, and any plants exhibiting symptoms of this disease should be cut off at the base so that the vine will have died and dried out before pruning time. Should a plant that has been missed be met with when pruning, the knife and hands if used on a diseased vine should be washed well in methylated spirits or soapy water before passing on to a healthy plant.

Recommendations.

Based on the results of the experimental work the following recommendations are now made for the control of brown spot of the passion vine:—

(1) Train the passion vines in a systematic manner right from the start, making sure that the main runners are kept well tied to their respective wires, as this facilitates subsequent pruning.

(2) Prune back laterals at least once a year either before the flowers for the summer crop have formed if a summer crop is desired, or later if the intermediate and winter crop is most favoured. A further trimming may be necessary after the vines have begun to shoot.

(3) Follow the pruning with a Bordeaux spray of 6:4:40 or 4:4:40 strength. This spraying should be repeated once a month until the end of January, and then once every six weeks or two months until next pruning time. When mature fruit are on the vine ammoniacal copper carbonate may be substituted for the Bordeaux. During the cool months special attention needs to be given to young shoots and fruit for the control of powdery spot and scab which is prevalent at that time.

For the first eighteen months most attention should be paid to training the young vine, spraying, except during the winter for powdery leaf spot, being not always necessary.

Summary.

The most serious disease of the passion vine in Queensland and a limiting factor in its cultivation is brown spot. This disease is responsible for a leaf spot, stem cincturing, and fruit spot, and its presence may ultimately result in the complete dying back of the vine.

Brown spot is shown to be caused by a species of *Macrosporium*, spore measurements and cultural characters of which are given.

The temperature reactions of the organism and the seasonal development of the disease are discussed.

Other species of *Passiflora*, including *P. quadrangularis* and *P. alba*, are shown to be subject to attack by the same disease.

Field experiments are briefly described whereby it has been shown that brown spot may be effectively controlled by systematic pruning and spraying. The value of pruning is discussed in some detail.

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CAMP FOR MEMBERS OF HOME PROJECT CLUBS.

IPSWICH SHOW, MAY, 1931.

The Ipswich Pastoral and Agricultural Society has requested the Department of Public Instruction to select fifteen boys from among the members of Home Project Clubs to attend a camp at the Ipswich Show in May next, as guests of the Show Society.

Nominations will be considered from schools on or near the following railway lines:—

Ipswich to Yarraman;

Ipswich to Murphy's Creek;

Ipswich to Dugandan and Mount Edwards; and

Ipswich to Marburg.

Schools which have completed their organisation of clubs on or after 1st September, 1930, may nominate members desirous of attending the camp. Other schools which desire to be represented should commence their club work not later than 7th February, 1931, and should furnish to the Department of Public Instruction by that date particulars of the membership of the clubs operating.

The Departmental Organiser will visit the various centres for the purpose of valuing the work of the club members, and the selection will be made on the comparative merit of the work done by the members.

These agricultural project clubs have a definite educational, as well as an economic value, and parents are urged to co-operate with the head teachers of the various schools in establishing club work in their districts.

CATERPILLAR CONTROL.

Some few weeks ago an armyworm outbreak was reported from the Darling Downs. Although the reports indicated damage of a serious nature to wheat and other crops, an investigation showed that the outbreak was localised and that the total damage was of a minor nature. However, in view of the possibility of future outbreaks the following standard control measures, drawn up by Mr. J. A. Weddell, Assistant Entomologist, should be of interest.

The standard control measures recommended to cope with an armyworm outbreak—measures that should be applicable in this instance, consist of the following:—

Where the extent of a local infestation is fairly clearly defined and there is danger of further spread of the caterpillars into neighbouring and relatively clean areas, the spread may be prevented by means of furrows dug either around the infested area or, if the caterpillars are on the move, at right angles to the main direction of the advance. The furrows should be dug, having the side next to the area to be protected as steep as possible. At intervals along the bottom of the furrow, holes should be sunk. As an extra precaution, a bait consisting of poisoned bran should be sprinkled along the furrow. The poisoned bran may be made up as follows:—

Bran	25 lb.
Paris green	1 lb.
Molasses	1 quart
Oranges	2 fruits
Water	2 gallons (about)

The Paris green and bran should, first of all, be mixed together in a thorough manner and while still dry. The molasses and the finely chopped fruit and its juice should then be added to some of the water. The water containing the molasses should next be mixed with the bran and Paris green and the whole should then be well stirred up, enough water being added to produce the right consistency.

It is highly desirable that the poison bait should be of the right consistency, and only sufficient water should be added to permit of its being in a crumbly state and thus capable of being easily scattered broadcast on the ground. It should, at the same time, be sufficiently moist to permit of each flake of bran taking up its quota of Paris green and molasses.

Neither the fruit juice nor the molasses is essential in this bait, although they are usually considered desirable.

Poultry and other domestic animals should not have access to areas that have been treated with poison bran baits.

The value of the furrow lies in the fact that the crawling caterpillars will usually follow the line of least resistance, and that once they fall in to the furrow they will move along its length rather than climb the steep side. They thus find and feed on the poisoned bran, and ultimately gather in the prepared holes where they die or may be conveniently killed and buried.

The sprinkling of the poisoned baits is of value within the area actually infested. The material mixed as described should be broadcast loosely into the foliage; some of it then remains in the foliage and the rest trickles to the ground, but in either situation it is readily accessible and acceptable to the caterpillars. The quantity mentioned above is usually considered sufficient for about half an acre when scattered broadcast.

Where a portion of the crop is already a total ruin and it is desired to kill the caterpillars, more especially to prevent further spread, the foliage may be sprayed with arsenate of lead, made up at the rate of 1½ lb. lead arsenate powder to 50 gallons of water. In this case, however, the grain crop will be dangerous as food for both man and beast, and this method must not be applied unless the owner is prepared later to destroy by burning the area so treated.

FARMERS' SHEEP AND WOOL.

By J. CAREW, Senior Instructor in Sheep and Wool.

PART III.

This is the third article of a series planned for the purpose of supplying information sought from time to time by readers interested in sheep and wool; and also with the hope of stimulating interest in sheep-raising on comparatively small holdings.

SELECTION OF BREEDS.

THE breed type most suitable to local conditions should be selected, for types as we know them have been evolved under special and selected conditions. The greater area of our merino country is suitable to the medium to strong types of that breed.

Very few flocks of the fine-woolled types are now bred, the medium and strong types being more generally raised. As they advance in age their wool "fines down" and most of our fine fleeces are produced by these older sheep. Usually the sheep are bred on the holding, therefore the most suitable breed and type is of first

PLATE 186.—SHEEP WATERING AT A DAM, STAMFORD, HUGHENDEN DISTRICT.

consideration. Many owners are satisfied to go on without culling, but as an inferior sheep eats as much as a good one it is sound policy to class the flock carefully, and endeavour to raise the standard to as high a level as possible under existing conditions.

Culling.

The proper time to cull is just before or during shearing, whichever is found more convenient. The average sheep farmer, who has ewes of a fair standard and of the type suitable to his conditions, can, with careful judgment, class his own flock. By introducing a suitable ram to mate with the best of the ewes, a start may be made to improve the flock.

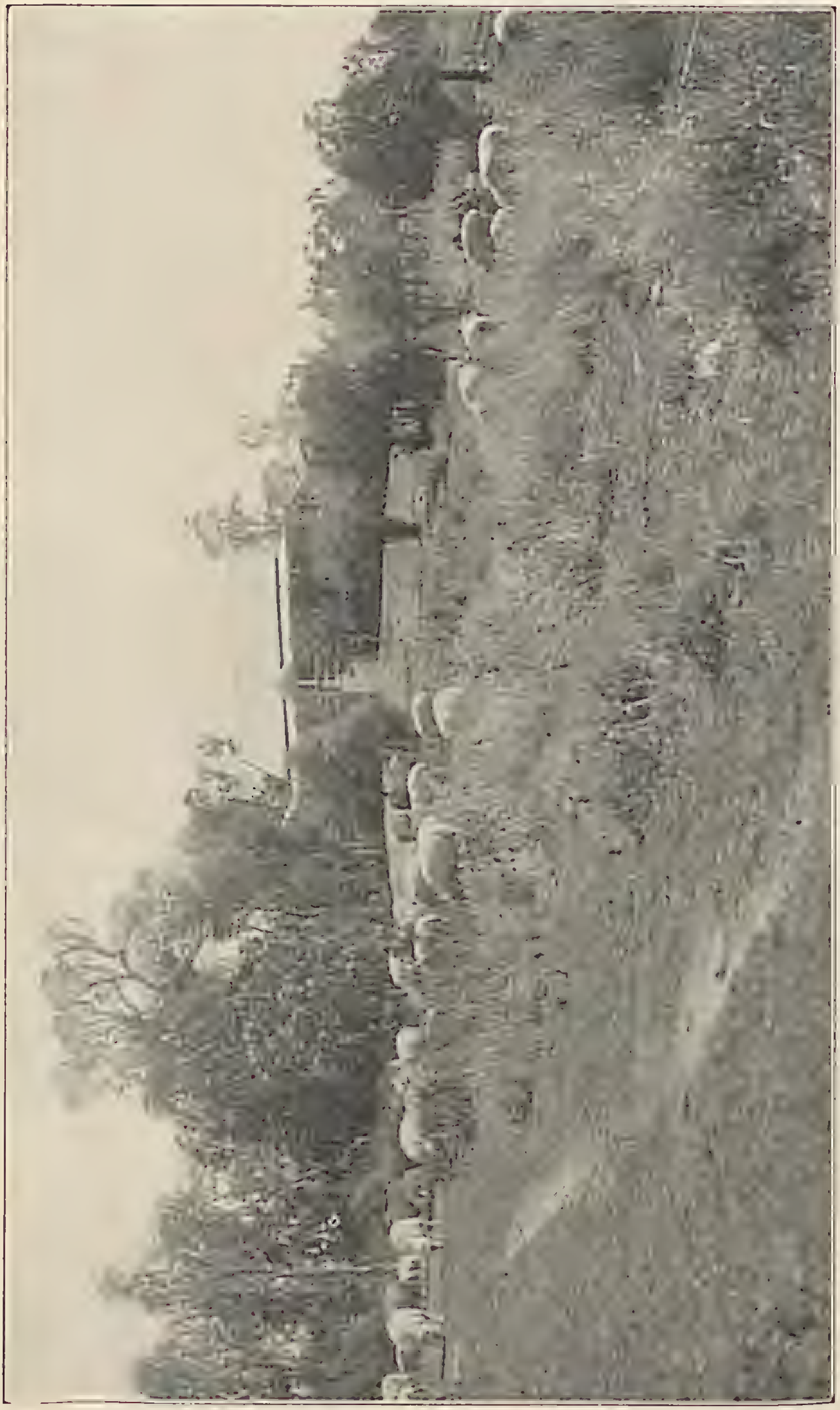

PLATE 187.—A FARMER'S FLOCK AT COALSTOUN LAKES NEAR BIGGENDEN, BURNETT DISTRICT.

By a sound system of culling, when a holding is fairly well stocked up, big losses may be averted. Firstly, all nondescript ewes should be fattened and sold.

The old breeding ewes, if culled for teeth defects, may be fattened before they become broken-mouthed, otherwise it is impossible to improve their condition. On large holdings sheep classing forms part of the yearly operations, and what is profitable to the large flock-owner may also apply to the small one.

Not only is it more profitable, but it gives a greater amount of satisfaction to possess a good flock, which should be the owner's pride. At the first the standard may not be high, but any sheep farmer who takes a proper pride in his flock will soon form his own standard of excellence. To achieve this, the first culling will be the number that can be spared economically.

A thorough inspection of each sheep as it is shorn, when all defects in the fleece are revealed, will soon convince the owner that the matter of culling is simple but very important. As the flock increases in numbers the percentage of culls may be greater until the standard aimed at is reached.

The chief aim should be to retain all full-sized, vigorous sheep according to type, possessing a well-proportioned body and showing a robust constitution, carrying a full, even fleece of good colour, and true to type.

Merino Types.

A fine merino should have a covering of fine dense wool, with spinning counts of 70s to 70s supers as a 4-tooth. They are more suitable to the cooler parts of the State, but if exposed to hard, dry conditions their wool is more subject to deterioration than the stronger types.

The medium type of sheep should be bigger bodied and more robust than the fine. They will be found suitable to the greater extent of our sheep country, and should produce a wool varying in spinning counts from 64s to 70s. They are a very desirable type and retain their chief characteristics to a great degree. As they grow older their wool is less robust; it ''fines down,'' and if well grown, as in normal seasons, will be found to possess a good length of staple of a desirable character.

The strong-woolled type of sheep are large, plain-bodied animals, more robust in every respect, with a deep-grown covering that resists dust to a greater extent, and will not deteriorate to the same degree under the trying conditions met with on the exposed western plains. To be a true, strong wool type they should produce a characteristic merino wool of 60s to 64s spinning counts in ewes and 60s to 58s in rams, but in each case they should possess a liberal length of staple.

To be a thoroughly efficient sheep classer it is necessary to be able to recognise the different types and qualities of merino wools as well as to discriminate between the types of sheep, when all circumstances likely to affect both sheep and wool must be taken into consideration.

[TO BE CONTINUED.]

QUEENSLAND SHOW DATES, 1931.

Stanthorpe: 4th to 6th February.
Allora: 18th and 19th February.
Killarney: 27th and 28th February.
Milmerran: 3rd March.
Pittsworth: 5th March.
Warwick: 10th to 13th March.
Toowoomba: 23rd to 26th March.
Oakey: 11th April.
Dalby: 15th and 16th April.
Chinchilla: 21st and 22nd April.
Taroom: 4th to 6th May.
Boonah: 6th and 7th May.
Murgon: 8th and 9th May.
Ipswich: 12th to 15th May.
Mitchell: 13th and 14th May.
Kilkivan: 20th and 21st May.
Biggenden: 21st and 22nd May.
Wowan: 4th and 5th June.
Lowood: 19th and 20th June.
Mount Larcom: 19th and 20th June.
Rockhampton: 23rd to 27th June.
Kilcoy: 2nd and 3rd July.
Cleveland: 10th and 11th July.
Rosewood: 17th and 18th July.
Ithaca: 18th July.
Royal National: 10th to 15th August.
Wynnum: 28th and 29th August.
Imbil: 2nd and 3rd September.
Beenleigh: 18th and 19th September.
Rocklea: 26th September.

AUSTRALIAN TRADE WITH THE EAST—II.

By Colonel D. E. EVANS, D.S.O., M.I.E.S., M.I.M.E.

The following notes by Colonel Evans, who is well known in professional and commercial circles in Brisbane, were made in the course of a recent visit to Japan, Korea, Manchuria, and China, and will be read with much interest by all concerned with the expansion of Australian trade in the countries of Eastern Asia, especially in relation to our primary products. The first instalment of this series was published in the November Journal.—Ed.

MANCHURIA is situated in the north-eastern extremity of China. Parts of Russian Siberia and Japanese Korea form its own north-eastern boundary. Its area, covering about 382,000 square miles, is almost the same as that of Egypt, or the aggregate area of Texas and New Mexico in the United States; it is almost half the size of Mexico, or more than three times the size of Japan proper; it is larger than New South Wales, about four times the size of Victoria, and rather more than half the area of Queensland. Its population is estimated variously at from 23,000,000 to 27,500,000, and it is now increasing rapidly through constant migration from China proper.

Plate 188.—Ploughing a Soya Bean Field.

Contrasted with other parts of China, its natural resources are rich, especially in agricultural, mineral, and forestry products. Its economic possibilities attracted the attention of neighbouring nations, but it was not until after the Russo-Japanese war in 1904-5 that it became more or less a land of opportunity for the world generally. The waters of the Yellow Sea and Gulf of Pechihli wash its southern shores.

Two large mountain ranges—the Khingans, Great and Little, and the Changpai—traverse its territory from north to south.

The valleys are extensive and generally fertile, while the mountainous regions are rich in timber and minerals. The country also possesses the advantage of large navigable rivers, among the chief of which are the Amur, Sungari, Yalu, and Liao. Though frozen in winter, each of these waterways during other seasons carries a large commercial traffic.

Although the indigenous native is the Manchu, 90 per cent. of the present population are Chinese.

The country has a most interesting historical background which, to those so inclined, would repay earnest study.

There are about 3,400 miles of railway in operation, mainly financed by foreign (principally Japanese) capital.

Plate 189.—A Soya Bean Field in Manchuria.

Plate 190.—Train Load of Soya Bean Cakes brought to Mixed Storage at Dairen.

Trade.

In the commercial history of Manchuria, the growth of Dairen as a world port, and the creation of a great export trade in beans, are the most significant features. Agricultural produce remains the principal item in outward manifests. Soya beans and their products (bean cake and bean oil) to-day command the world's markets. For many years these products constituted more than half the total exports of Manchuria. Millet, wheat, maize, and barley are also important exports. Imports are made up mainly of steel, machinery, cotton yarns and fabrics, mineral oils, and woollen goods.

Agriculture in Manchuria.

Manchuria has been described as the "granary of Asia," as possessing "one of the richest soils in the world," or as "the land of opportunity." Its agricultural possibilities were not realised generally until railway development was extended along the Liao Valley after the Russo-Japanese war. To-day the country is supplying a large proportion of the requirements of Japan in foodstuffs and raw materials for industrial purposes.

The principal cultivated crops are the world-known and valued soya bean and kaoliang, the staple food of the native.

PLATE 191.—PLANTING THE SOYA BEANS.

Besides those already mentioned, other products include hemp, flax, ramie, tobacco, rice, cotton, and silk. Of live stock, cattle, horses, donkeys, mules, sheep, and pigs are important. Lack of reliable statistics makes it difficult to state quantities of production.

Kaoliang or sorghum, being not only the staple food of the native population, but the principal grain food of numerous animals engaged in farm work, the major portion of the cultivated land of Manchuria has for centuries been cropped with this grain, and its production surpassed even the bean. Bean cultivation has gradually extended, however, as the world's markets strengthened their insistent demand.

Soya Beans.

The story of the Manchurian bean is one of the most interesting romances in economic history. The Japanese found some compensations for their heavy expenditure in the Chino-Japanese war in the mid-nineties in the discovery of the Manchurian bean, which revolutionised the fertiliser industry and became a substitute in the Japanese rice field for the dry herring fertiliser then extensively used. Ever since Japan has been the heaviest purchaser of the soya bean.

The first foreign trial shipment was sent from Dairen to Liverpool in 1908, and this was the beginning of a new industry in England, Germany, Denmark, and Holland. Germany's consumption subsequently became greater than all. At the time of the universal shortage of food during the European war, the Manchurian bean was a very important factor in the world's food supply.

Plate 192.—Soya Bean Graded at Mixed Storage at Dairen awaiting Shipment.

Plate 193.—Soya Beans being unloaded at the Railway Yard of Changchun Station.

The demand for this bean is ever increasing. Beans and bean cake imported by Japan, as foodstuff or fertiliser, are to-day helping in the solution of the national food problem.

The influence of the Manchurian bean on national economy is remarkable. Denmark was self-supporting in the production of cereals, especially wheat, until about thirty years ago; but through American large-scale production, Danish products were unable to compete successfully, even in the home market. Aided by the Manchurian bean, the Danes turned to extensive and intensive stock breeding. The bean is imported, the oil extracted and used for making margarine, soap, &c., while the residue is used extensively as stock food. Holland, to some extent, follows the same practice.

To climate and soil are ascribed the high quality and quantity production of the soya bean in Manchuria. The average yield is 20 bushels an acre in Manchuria, while it is 18 bushels in Japan, 18 in the United States, 13 in Korea, and 14 in China. Manchurian production amounts to more than half of the world's output from this crop. While bean production is increasing every year in Manchuria, it is at a standstill, more or less, in other countries.

PLATE 194.—EXPERIMENTAL TOBACCO PLANTATION AT FENGHUAGCHENG MODEL FARM.

The reason why the Manchurian bean commands world-wide popularity is the actual value of this staple food for man and beast, fertiliser, and as raw material in various chemical industries. It is said to contain a higher protein content than the product of other countries. Whether that is so or not, it is hard to say, but there is certainly no reason why that claim should not be tested in Queensland. The constituents would vary, of course, more or less according to locality, variety, and season.

Manchurian beans are divided into four classes according to colour—yellow, white, green, and black. The chemical composition of these beans, according to analyses made in 1927 by the Central Laboratory at Dairen, is as follows:—

——	Moisture.	Crude Fat.	Crude Protein.	Crude Fibre.	Nitrogen Free Extract.	Crude Ash.
	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
Yellow	11·06	18·19	39·94	5·20	21·41	4·30
Black	11·96	14·74	41·00	5·34	23·01	4·20
Green	8·13	18·96	40·12	5·45	22·54	4·80

[TO BE CONTINUED.]

A POULTRY MITE INFESTING DWELLINGS.

By F. H. S. ROBERTS, M.Sc., Veterinary Entomologist and Parasitologist.

Within the past two months instances of a poultry mite infesting houses and attacking man have been brought under the notice of this Department. Inquiries usually state that starling lice are the causal agents, but in the cases under consideration a species of poultry mite was found to be the cause of the discomfort to the inmates of the dwellings concerned.

The mite in question is known as the Tropical Poultry Mite, *Liponyssus bursa* Berlese, and, as the popular name implies, it is usually found on the domestic fowl, causing great discomfort at times to the nesting hen, and capable, if unchecked, of bringing about fatal results among the newly hatched chickens. This tiny parasite, like all mites, possesses four pairs of legs and is usually reddish in colour, the colour being caused by the ingested blood. In size it rarely reaches beyond .7 mm. or about 1/30 inch—i.e., not as big as a pin's head. The blood is sucked in through a tubular apparatus, part of which is the long chelate stylets which pierce the skin of the host.

PLATE 195.

THE TROPICAL FOWL MITE, *Liponyssus bursa* Berlese.

These mites usually infest the nests and surroundings, attacking the birds only when food is required. The tiny egg is laid away from the host and in a short time hatches out into a larva which differs from the adult by possessing three pairs of legs instead of four. After the first moult or shedding of the skin four pairs of legs appear, and following one to three further moults the adult form is reached.

Besides the domestic fowl, *Liponyssus bursa* has been found on the domestic pigeon and common sparrow, and is probably conveyed from one locality to another mainly by these hosts. Both pigeons and sparrows nest in dwellings, and if these mites are present they will remain with the birds so long as the birds frequent the nest. Once nesting is finished and their hosts are fled, numbers of the parasites descend into the dwellings and attack any animal, including, of course, man, with

which they come into contact. In the cases cited, infestation of the dwellings was traced to pigeons which had vacated their nests, leaving the mites to starve. Fortunately, although their attack brings about acute discomfort to the inmates, they are able to live only about ten days away from their warmer-blooded hosts, and also appear incapable of breeding. As a rule, therefore, unless the building houses a large number of birds, the parasites do not last longer than about ten days.

Numerous other species of mites, other poultry mites, and rat mites have been recorded as attacking man, their infestations causing general, intense, and continuous pruritus or itching. The irritation may disappear within a few days, but if friction is resorted to as a relief an ulcerous condition may be set up.

As a first measure in the eradication of such parasites the nests of the birds—pigeon or sparrow—should be located and removed. The premises should then be thoroughly sprayed with a carbolic solution or some other efficient insecticide, such as a pyrethrum-containing solution, of which several proprietary mixtures are on the market.

For the treatment of the bites, the Health Department recommends the bathing of the affected areas with a weak carbolic acid solution—1 in 40 would do—and the application of the following ointment:—β/ Naphthol, 15; lard, 100; green soap, 50; lanoline, 10.

THE CARE OF THE CAR.

Every year sees the motor car improved; sometimes the improvement is an important step and sometimes only a refinement, but it is safe to say that in the motoring world at least the motto "Every day in every way we get better and better," is lived up to.

Looking back over the past decade, we see remarkably rapid changes in motor-car construction. After the war the heavy four-cylinder car dominated the motor market. The engine was usually lacking in acceleration, and riding comfort did not exist as compared with the modern car. About 1920 the more flexible six-cylinder engine began to gain in popularity, or rather car builders began to turn out six-cylinder cars at a reasonable figure. The year 1924 saw four-wheel brakes introduced on numerous models, and 1925 saw the balloon tyre gain its popularity.

To-day two major improvements in the transmission system are engaging the minds of keen motorists. They are the silent gears and the free wheel.

The transmission system of the average car has always been one of its weaknesses. The skill required in effecting gear changing has frightened many a would-be motorist, and is a worry to many experienced drivers, also the noise made by most cars when running in the intermediate gears has been unpleasant, to say the least.

Difficulties in gear-changing, together with noise in gears, have made the "go-anywhere-in-top" car popular, although such cars consume much more petrol than the car that requires gear-changing.

The Silent Gear.

When the usual type of gear is used its silence in operation depends chiefly upon two factors—its accuracy of machining and its size compared with the amount of work it does. High-grade cars fitted very large gears and had them ground so perfectly that the noise in gear was not very pronounced. However, in a light car the gear must necessarily be light, and because of the vibration set up as the strain is transferred suddenly from one tooth to the next the gears tended to whine. The obvious way out of the difficulty was to use gears so arranged that each tooth took up its load gradually. So-called helical gears do this because the teeth are cut on a bias across the face of the gear wheel. It is obvious, however, that helical gears are not suitable for sliding into mesh, as is done in the usual type of gear box. Therefore ingenious gear boxes were designed in which the next gear to top (third in a four-speed box, second in a three-speed box) was permanently in mesh and the drive was actually engaged by means of dogs on the main shaft. Another form of silent gear was obtained by using an internal gear—that is, a pinion meshing with gear teeth on the inside of a ring. When this method is used, instead of one tooth taking all the load at any instant, the load is shared among several teeth so that the operation is comparatively silent.

The introduction of silent gears changed the outlook of many manufacturers in the matter of top-gear performance, so that cars that until recently were fitted with three gears now have four forward speeds, the silent third gear being used for work in traffic or for hill climbing, whereas the top gear is used for high-speed driving on the other road.

The Free Wheel.

For many years motorists have discussed the possibilities of using a free-wheel attachment on the motor car, and for the last three years it has been possible to have a free wheel fitted to many European cars as an extra. However, this year the free wheel has been standardised on a very popular American car, so that it may be said that the free-wheel fashion is established.

The free wheel is essentially a device in the transmission which allows the car to over-run the engine without speeding the engine up. Motorists who have ridden an ordinary bicycle will appreciate how the free wheel acts.

The free-wheel device is usually placed just behind the gear box, so that immediately the throttle is released the engine and gear box will slow down to idling speed, but the car will coast along just as if it were in neutral. When the engine is again accelerated the drive will be taken up by the engine immediately the engine reaches the speed that corresponds to the speed of the car.

The free wheels used on motor cars are not fitted with ratchet devices, but are usually an arrangement not unlike a roller bearing, which runs freely when rotated one way but which jams when rotated the other way.

Gear Changing on a Free-wheel Car.

The addition of the free wheel to a car makes gear-changing simplicity itself, because it is no longer necessary to judge the speeds of the two gears to be meshed. Immediately the clutch is depressed the jack shaft to the gear box is released and comes to rest, whereas the free-wheel device frees the main shaft in the gear box and it also comes to rest, so that the changing of gears is actually effected in a gear box in which the pinions are not revolving. In fact, the gears are usually changed without touching the clutch, because immediately the accelerator is released the free-wheel device operates, and the engine and gear box slow down to idling speed; since the gears have no load upon them it is possible to change gear with the clutch still engaged without the slightest clashing of gears.

The free-wheel device results in a marked economy in the petrol consumption, because the engine merely idles when it is not required. With the ordinary fixed-drive car, the engine acts as a brake when the throttle is closed, so that often the car is being braked unnecessarily. Also when the engine is being driven by the back wheels considerably more fuel is sucked through the carburetter than is the case when the engine is merely idling. The economy in fuel is estimated to be approximately 15 per cent.

The economy in lubricating oil is also very marked, because it is when the car is driving the engine that oil is sucked into the combustion chamber and wasted. Lastly, the life of the engine is increased, because when the free wheel operates the engine revolves slowly, and as a consequence the number of revolutions of the engine for any given trip is reduced enormously. The life of an engine, provided it is properly cared for, depends upon the number of revolutions it makes.

The writer has heard the objection raised to the free wheel that it prevents the engine being used as a brake, which is essential when descending long steep hills. However, all free-wheeling devices are provided with a means of locking the free wheel so that the objection raised has no significance.—"Radiator" in the "Farmer and Settler."

A HELPFUL JOURNAL.

A Toowoomba farmer, renewing his registration, writes (12*th November*, 1930): *"I have found the Journal very helpful."*

A Nanango farmer writes, 10 *November,* 1920: *" . . . I appreciate the Journal very much."*

CITRUS FRUITS.

FIELD TRIALS IN SOUTHERN AND CENTRAL QUEENSLAND.

The Director of Fruit Culture, Mr. George Williams, has received the following progress report from Mr. R. L. Prest, Instructor in Fruit Culture, on field trials of citrus fruits in Southern and Central Queensland:—

IN Central and Southern Queensland, co-operative field trials in citrus culture have been conducted by the Fruit Branch during the years 1928 to 1930.

Many of the recommendations and conclusions which follow are in harmony with, and have been set forth as a result of, similar investigations elsewhere.

It was realised at the outset that the problems to be studied, such as low production and lack of vitality of citrus trees were in evidence in all centres, hence the field trials were located on the heavier red volcanic soil and sandy alluvial soil. Many observations made in orchards on other soils have added to the information gained.

No. 1 orchard for field trial is located at Mapleton on the property of the Mapleton Farm College. The trees were twenty-five-year Valencia Late and Washington Navels, and were in a decayed and unproductive condition when the trials commenced.

No. 2 orchard is located on the property of Mr. R. A. Ulcoq, Gayndah, Central Burnett district. There the trees were fifteen-year-old Beauty of Glen Retreat mandarins which were weakly, mottling, with a considerable amount of dead twigs and terminal branches.

No. 3 orchard is located on Mr. V. G. Pack's property at Montville. The trees included twelve-year old Valencia Late, Sabina, and Scarlet and Fewtrel Early oranges and mandarins. Although apparently healthy the trees appeared hide-bound and were not growing freely and bore unsatisfactory crops.

No. 4 orchard is located at Inglenook, Palmwoods. The trees there were six-year-old Valencia Late and two-year-old Beauty of Glen Retreat mandarins. The former were very unthrifty trees.

Fertilisation.

The red volcanic soils are commonly relatively rich; citrus trees on these soils respond to proper fertilisation, as also do those on the deep, well-drained, sandy alluvial soils. On plots Nos. 1 and 3 essentially similar materials were used, but as trees were of greater age larger quantities were applied on No. 1. Plot No. 2 on sandy soil received a slightly different fertiliser.

All plots were dressed with agricultural lime at the rate of one ton to the acre.

		Per tree. lb.
Plot No. 1.—	Nitrogen	2.4
	Phosphoric acid	2.5
	Potash	1.9
No. 1A.—	Nitrogen	3.0
Plot No. 2.—	Nitrogen	1.3
	Phosphoric acid	1.4
	Potash	1.4
No. 2A.—	Nitrogen	1.9
Plot No. 3.—	Nitrogen	1.2
	Phosphoric acid	1.6
	Potash	1.4

Materials used were sulphate ammonia, dried blood, Nauru phosphate, and sulphate potash. The applications were made twice a year in August and March.

Irrigation.

Plots Nos. 1 and 3 were under natural rainfall, being in the coastal belt. No. 2 received light irrigation; the supply failed, but was re-established in July, 1929.

Cultivation.

During the drier months constant cultivation was carried out until towards the end of October, when a green cover crop of cowpea or bean was planted, to be ploughed under in March-April as weather conditions permitted.

Table I. shows the average tree production prior to 1928, the average tree production for 1928, 1929, and 1930, and the two years' average for 1929 to 1930.

The 1928 crop was generally heavy throughout the State. The trials commenced in the late spring of 1928.

COMMENTS ON YIELDS AND TREATMENT.

Weather, of course, influences greatly any crop grown in the open air. The dry spring and winter of the 1928-29 season had a serious effect on the crop which was exceptionally light throughout the State, the December drop being particularly heavy.

In spite of adverse weather conditions, there was marked improvement from the commencement. The trees increased their vigour, foliage improved, fruiting wood was increased and satisfactorily matured, and a good crop produced.

The fruit was well distributed over the trees, even in size, of good quality, bright, and markedly freer from disease.

With the more favourable growing conditions experienced in 1930 results were even more gratifying. In the coastal belt heavy wastage was experienced during the harvesting of the crop. The figures quoted in Table I. are for cases marketed; wastage is not included.

Though nitrogen appeared to be the most important element required, results indicated the necessity for balancing the food supplies. The three elements generally most rapidly depleted in the soil being nitrogen, phosphoric acid, and potash, were replaced by the addition of sulphate ammonia, dried blood, Nauru phosphate, and sulphate potash. The quantities used must in no way be considered correct for all conditions; they are, however, a guide for any similar set of conditions frequently met with.

In making available the plant nutrients added in the fertiliser, consideration of soil conditions was a most important factor. The absence of adequate supplies of farmyard manure necessitated green crop practice. The summer rains were made use of to grow a leguminous cover crop, which also assisted to prevent soil erosion, as well as taking up extremely soluble plant nutrients preventing them from being lost in the drainage water.

The carbon, oxygen, and hydrogen of plants come largely from air and water and the ploughing under of green plant crops, therefore increase the store of such constituents in the soil. The compounds that result from such crop decay increase the absorptive power of the soil and promote aeration, drainage, and granulation. If the crop turned under is a legume and the nodule organisms are active, the store of soil nitrogen is augmented.

Again added organic material acts as a food for soil organisms, and tends to stimulate biological changes to a marked degree. This biological action is especially important in the production of carbon dioxide, ammonia nitrates, and organic compounds of various kinds which are necessary for plant nutrition.

Nitrogen appears to be the most important element required—not only is it absolutely necessary for the plant's growth, its stimulation of the vegetative parts, and its close relationship to the general tone of the fruit, but also it was not one of the original elements of the earth's crust. During the formation of the soil it slowly and gradually became present through being brought down by rains and fixed naturally through the agency of bacterial acitvity. It now exists in nitrogenous compounds of the more or less decayed organic matter.

One of the possible limiting factors to the crop growth is the lack of water-soluble nitrogen at critical periods in quantities necessary for normal growth. It is the only one of the three common fertiliser elements; when added in excess will result in harmful after effects on the crop. It may delay maturity, lower the quality, and decrease resistance to disease.

Phosphoric acid hastens the maturity of the crop by its ripening influences, and also encourages root development, especially the lateral and fibrous rootlets. Excessive quantities of phosphoric acid ordinarily have no bad effect, for phosphorus does not stimulate any part unduly, nor does it lead to a development which is detrimental. Phosphorus is a balancing power on the unfavourable influences generated by the presence of an undue quantity of nitrogen.

The presence of plenty of available potash in the soil has much to do with the tone and vigour of the plant. By increasing resistance to certain diseases it tends to counteract the ill effects of too much nitrogen, while in delaying maturity it works against the ripening influences of phosphoric acid. In a general way, it exerts a

balancing effect on both nitrogen and phosphate materials, and consequently is important in a mixed fertiliser, if the potash of the soil is lacking or unavailable.

At the commencement of the trials the fertiliser was applied in two dressings, August and March. Later this was altered to three applications a year, and in the case of plot No. 2, four were applied; the smaller and more numerous dressings are recommended. A more even supply of plant nutrients is assured and any losses by leaching are greatly minimised.

TABLE I.

—	——	Plot No.	Average before Trials.	Average for 1928.	Average during Fertiliser Trials. 1929.	Average during Fertiliser Trials. 1930.	Average for Two years.	Increase Average
			Cases.	Cases.	Cases.	Cases.	Cases.	Cases.
I.	Agricultural lime, 1 ton per acre; Sulphate of ammonia, 12 lb. per tree; Nauru phosphates, 14 lb. per tree; Sulphate of potash, 4 lb. per tree	I.	1½	2	2	8	5·0	3·5
	Sulphate of ammonia, 15 lb. per tree	IA	1½	2	2	7	4·5	3·0
II.	Gypsium, 1 ton per acre; Sulphate of ammonia, 4 lb. per tree; Dried blood, 4 lb. per tree; Nauru phosphates, 8 lb. per tree; Sulphate of potash, 3 lb. per tree	II.	1½	2	3	8	5·5	4·0
	Dried blood, 16 lb. per tree ..	IIA.	1½	2	2½	6	4·25	2·75
III.	Agricultural lime, 1 ton per acre; Sulphate of ammonia, 6 lb. per tree; Nauru phosphates, 9 lb. per tree; Sulphate of potash, 3 lb. per tree	III.	2	4	3	7	5·0	3·0

TABLE II.

Plot.	Number.	Cost of Fertiliser.	Average Net Return.	Average Increase in Returns (net).
		s. d.	s. d.	s. d.
I.	I.	4 6 per tree	5 0 per case	17 6 per tree
	IA.	4 6 per tree	5 0 per case	15 0 per tree
II.	II.	3 0 per tree	9 0 per case	36 0 per tree
	IIA.	3 0 per tree	9 0 per case	24 9 per tree
III.	III.	3 0 per tree	5 0 per case	15 0 per tree

The Young Farmer.

NOTES ON MILK AND CREAM TESTING—I.

By OFFICERS OF THE DAIRY BRANCH.

THE following notes are intended to assist students in preparing for their theoretical examination for the milk and cream testing certificate, conducted by the Department of Agriculture and Stock in July each year.

These notes are not intended as a substitute for a text-book, but as a supplementary thereto, and students are advised to procure a standard work on the subject. They should obtain as much practical experience in testing as possible, for in the practical examination ease of manipulation is of paramount importance.

Under the regulations governing the issue of milk and cream testing certificates the following subjects are scheduled:—

(1) Elementary knowledge of the secretion of milk and factors which influence the same.

(2) The composition of milk and cream and factors which induce variation therein.

(3) Estimating by the Babcock method the quantity of butter fat in milk and cream from weight and volume of samples.

(4) Errors which may occur in testing, and how to correct or avoid same.

(5) Estimating solids in milk.

(6) The collection of samples, and means of preserving same.

(7) Recording and computing results of testing.

(8) Methods of testing for acidity, moisture, and preservatives.

(9) The over-run, and factors which influence it.

(10) The legislative measures in the various States.

Text-books recommended: Van Slyke or Farrington and Woll.

Composition of Milk.

The principal constitutents of milk may be classified into—

(1) Water of which normal milk contains approximately 87.1 per cent.

(2) Fat of which normal milk contains approximately 3.9 per cent.

(3) Proteins (casein and albumin) of which normal milk contains approximately 3.2 per cent.

(4) Milk sugar of which normal milk contains approximately 5.1 per cent.

(5) Mineral salts or ash of which normal milk contains approximately .7 per cent.

"*The Dairy Produce Act of* 1920" prescribes that milk shall contain not less than 3.3 per cent. of fat and not less than 8 per cent. of milk solids (not fat).

Water.

The quantity of water normally contained in milk varies at individual milkings and is influenced by certain conditions, such as individuality of the cow, breed, stage of lactation, age, character of food, amount of water drunk, and state of health.

Fat.

Milk-fat is generally called butter-fat, and is a variable mixture of several different compounds called glycerides. Each glyceride is formed by the chemical union of glycerine with some particular acid. There are about ten different acids found in milk-fat, but some are present in small proportions. The principal acids are palmitic, oleic, myristic, butyric and stearic. The compounds formed by each of these acids with glycerine are termed palmitin (i.e., glycerine combined with palmitic acid), olein, myristin, butyrin, and stearin.

Fat Globules in Milk.

The fat exists in milk in the form of exceedingly minute globules. In one drop of milk there may be about 100,000,000 of these fat globules. The size and number of these globules vary in the milk of the different breeds of cows and are also influenced by the stage of lactation, food, health, and age, while they vary in number at different milkings or at different parts of the same milking.

The quantity (or percentage) of fat in milk may be influenced by—

1. *Individuality of cow.*—It is uncommon to find two animals in a herd whose milk contains the same percentage of fat.

2. *Breed of cow.*—The percentage of fat in milk varies in a somewhat characteristic way with the kind of breed of cow. While individual cows vary in test in the same breed there is usually a fairly uniform difference; and if we consider averages we find that they also vary in the different breeds.

3. *Advance of lactation.*—As the stage of lactation advances and the flow of milk diminishes the fat percentages increases after about the third month, although, of course. the actual quantity of fat produced at each milking is less.

4. *Variation of time between milkings.*—As a rule the longer the time between two successive milkings the smaller is the percentage of fat in the milk.

5. *Fat variation.*—The first milk drawn at a milking contains the least fat while the milk last drawn (strippings) is the richest in fat.

6. *Other influences*—External or internal influences, such as climatic conditions, treatment, excitement, sickness, &c., also influence the fat content and the quantity of milk.

Proteins.

The number and nature of the proteins in milk is a matter on which dairy scientists differ, but it is generally recognised that there are three or four of them, the chief of which are casein and albumin.

Casein.—Casein is a combination of carbon, hydrogen, oxygen, nitrogen, phosphorus and sulphur.

It exists in milk not in solution, but in the form of extremely minute, solid, gelatinous particles in suspension similar to the fat globules.

Casein coagulates in the form of curd when milk develops acidity and becomes sour or when rennet is added. Heating to boiling point will not coagulate the casein unless a certain acidity is reached.

In milk, casein is combined with calcium to form a lime salt (calcium casein), and in this form is soluble although pure casein is not. This soluble casein gives milk its white, opaque appearance.

Albumin differs from casein in composition and behaviour. It is not coagulated by rennet or by acids, but remains in the whey. It coagulates by heating. It is found in solution in milk.

Milk Sugar.

Milk sugar is also called lactose. It is present in milk in solution. In general composition it resembles ordinary sugar, but is less soluble in water and not so sweet. It is easily converted into lactic acid by certain forms of bacteria. In cheese-making, milk sugar largely passes into the whey.

Mineral Salts or Ash.

The mineral salts of milk are left in the form of ash when milk is evaporated to dryness and incinerated. It consists chiefly of lime, potash, soda, and magnesia.

General Remarks.

In addition to the foregoing, milk contains many other organic compounds in small quantities in addition to certain gases—carbonic acid gas, nitrogen and oxygen.

It will thus be noted that milk contains water, fat, casein, albumin, sugar, salts, and some other constituents in small quantities.

The fat and casein and some of the salts are in suspension, while albumin, sugar, and the larger portion of the salts are held in solution by the water.

[TO BE CONTINUED.]

POINTS IN CALF-REARING.

Always handle calves quietly and patiently, and so develop in the animal a sense of confidence in the human forster-parent which will remain with the calf till it reaches maturity.

Feed at regular times each day and in regular quantities.

Feed only perfectly clean, sweet milk—the calf is not designed to assimilate any other. Add some constituent to replace the feed value of the cream removed from the milk.

Feed the milk at body temperature. Cold milk requires a great deal of the animal's energy to heat it up to a point at which digestion can take place.

Cleanse feeding buckets as carefully as you would all other dairy utensils. Cleanse the yards and their surroundings to destroy breeding places of flies, which are active carriers of disease.

Provide shade in summer, and shelter from winter wind and rain. It is cheaper to conserve animal energy in this manner than by the use of larger amounts of food.

Always pick up any pieces of rag, paper, twine, &c., found about the calf paddock. Young calves exhibit a delight in picking up foreign substances of thos nature, and ultimately swallowing them, and indigestible material of this description is almost sure to set up a serious form of gastro-enteritis in young calves.

QUALITY IN CREAM.

The test of the cream has an indirect effect on quality in some instances, and for this reason it is always desirable to run the cream at the proper thickness. For the summer months the test should be between 40 and 42 per cent., while during the colder months it may be reduced to from 36 to 38 per cent. A thin cream, that is, a low testing cream, never has the same keeping quality in hot weather, owing to the increased amount of separated milk present and a greater bacterial action. This should be attended to, as the adjustment of the cream screw is only the matter of a moment.

The mixing of warm, freshly separated cream with a cold, ripe cream from a previous separation is very often accompanied with disastrous results as regards quality. It is bad practice for several reasons, one being that the temperature of the bulk of the cream is thereby increased, resulting in increased bacterial activity. Again, if the older cream is very acid and thinly separated, the casein will most likely be precipitated in the form of white specks, which everyone is acquainted with as ordinary curdled cream, or again a ''junkety'' condition may be indirectly brought about. All these defects may result in the cream being graded second quality.

Fortunately, this practice is fast disappearing, but it sometimes occurs where cream is forwarded daily to the factory. The cream lorry comes soon after the morning separation, and in order to get both separations away the creams are mixed while the morning separation is still warm. ''Junkety'' cream often occurs where this is done, and to obviate it the morning cream should be cooled before mixing. If a cooler is not available for this purpose, by standing the tub in a can of water and stirring the cream briskly for ten minutes the temperature can be reduced slightly.

Stirring of cream two or three times daily helps to maintain the cream in good physical condition and to liberate any gas which may form. If the cream is left standing for hours before stirring there is a tendency for the heavy portion (casein, &c.), to gradually settle towards the bottom and for the fat to rise to the top, especially if the cream is inclined to be thinly separated. This is not desirable, and stirring will prevent it. A tinned steel or tinned copper stirrer should be used; on no account should a wooden stirrer be employed for this purpose.

It is quite well known that milk from newly calved cows will cause trouble when included in the general supply before it becomes normal, but it is not so generally recognised that some cows when advanced in their milking period will secrete abnormal milk, which will affect the cream and cause it to be graded second quality. This is particularly so when a cow has been milking for a long period, say, twelve months or more, as happens when a cow does not go in calf readily. When this type of cow begins to spring the milk will probably become abnormal, and the cow should be dried off, or the milk fed to the pigs.

Answers to Correspondents.

Liming.

"INQUIRER"—

Liming has passed the experimental stage and is destined to be used extensively on acid soils which exist throughout the State. Liming benefits acid soils by adding to the calcium requirements of the soil and thereby supplying the demands of crops, particularly lucerne, clover, and mixed pasturage. By neutralising acidity and certain poisonous substances found in acid soil, it creates more favourable conditions for the growth and activity of helpful soil bacteria and encourages the growth of the plant roots and renders plant food more available. It improves the texture of the soil and assists in the conservation of moisture. Used in conjunction with commercial fertiliser the returns are improved.

BOTANY.

The following answers have been selected from the outgoing mail of the Government Botanist, Mr. C. T. White, F.L.S.:—

Wild Carrot. Chicory.

W.D. (Goondiwindi).—The three specimens of herbage have been determined as follows:—

No. 1 contained mostly *Apium leptophyllum,* a native plant commonly known as Wild Carrot, not being distinguished from the common Wild Carrot by any distinguishing local name. It is very common in coastal Queensland and the Darling Downs, and I collected specimens at Yelarbon some years ago. Generally speaking, on the Downs it is mostly a weed of cultivation or comes up round stockyards and so forth; in fact, anywhere where the ground has been disturbed. There were a few specimens of the ordinary Wild Carrot *Daucus brachiatus,* mixed with this.

No. 2 was *Daucus brachiatus,* the common Wild Carrot. This belongs to the same genus as the garden carrot. No. 1 to the same genus as the celery.

No. 3 represents *Cichorium Intybus,* the chicory. This plant has been naturalised in parts of the Darling Downs for some years past, and has proved itself a weed in many localities. When it runs wild it loses the large carrot-like tap root for which it is cultivated in certain places as an adulterant of coffee.

Saffron Thistle.

W.R. (Mondure)—

The specimen of thistle is *Kentrophyllum lanatum,* the Saffron Thistle, or Star Thistle, a native of the Mediterranean region that has now found its way as a weed into most of the warm and temperate regions of the world. It is very common in New South Wales and the other Australian States and is found in Queensland, though not so abundantly, we believe, as in the more southern parts of Australia. Some stockowners in South Australia and Victoria have spoken highly of the plant as a fodder in its younger stages, but it soon runs up to a hard stem and becomes quite unpalatable. The plant should be destroyed as far as possible when it first makes its appearance on a property.

Star Thistle.

R.V. (Ipswich)—

The specimen is *Centaurea melitensis,* the Star Thistle, a native of Southern Europe, now a naturalised weed in most warm temperate countries. It is found in various parts of Queensland, but does not seem to be as bad a pest here as it is in some of the Southern States, particularly New South Wales and Victoria. In the former State it is commonly known as "Saucy Jack" or "Wild Irishman," and is one of the worst weed pests they have. It has a certain fodder value when very young, but soon becomes woody and unpalatable. It is an aggressive weed, and should be destroyed when it first makes its appearance on a property.

Sudan Grass.

J.S. (Westbrook, Toowoomba)—

Both specimens represent the true Sudan Grass, *Sorghum sudanense.* Practically all the Sorghums, which include plants very similar in general appearance to the Sudan Grass, such as Johnson Grass and a large African species, *Sorghum verticilliflorum,* known as Wild Sorghum, naturalised in Queensland, contain a prussic acid yielding glucoside, particularly in their younger stages. Used with discretion, however, the plants are undoubtedly very valuable fodders.

Cannas.

H.R. (Cooroy)—

Cannas are not known to be poisonous in any way. One of them, as you probably are aware, is the source of most of the Arrowroot that is prepared in Queensland. The tubers of this particular species (*Canna edulis*) make quite a good food for pigs either raw or cooked. The poisonous principle of young Sorghum is a prussic acid yielding glucoside, and this is not known to occur in Cannas.

Tea Tree.

R.C.B. (Chinchilla)—

The specimen is a species of Tea Tree—*Melaleuca nodosa.*. We were very pleased to get the specimen as the plant is very common on the coast, but yours is the most western so far received. We have had it before, however, from country round Eidsvold and one or two other places in the Burnett district. On the coast the tree usually grows on poor and usually badly drained soil.

Wild Passion Fruit—A Dangerous Plant.

L. L. M. (Malanda, N.Q.)—

The specimen is the Wild Passion Fruit, *Passiflora fœtida,* a tropical American species widely spread over the tropics of the world, and planted as a cover crop in coconut plantations, &c. It is naturalised in most tropical countries, including North Queensland. The ripe fruits are eaten by natives and by children, but nevertheless the plant is a dangerous one, the leaves and green fruits containing a prussic acid yielding glucoside. The plant if eaten in quantity would, therefore, act in the same way as young Sorghum or Sudan Grass, death from eating it being fairly rapid. We should think that, on the whole, stock would have to eat a fair quantity of the plant before any ill-effects became noticeable. The stomach contents forwarded were in rather a decomposed state for examination.

Destruction of Tobacco Bush.

"Inquirer"—

As the stock are to be allowed to run in the paddock in which the Tobacco Bush is growing, there would be too great a risk to use an arsenical poison. You are advised to try spraying with a 10 per cent. solution of Sodium Chlorate, which is non-poisonous to man or beast. If the bushes are very large and woody, better results will be obtained if they are slashed with a brushhook previous to spraying. Sodium Chlorate may be obtained from A.C.F. and Shirleys Fertilizers, Limited, Brisbane. The price is about 10s. per 14 lb.

Beans.

"Inquirer" (Port Moresby, Papua)—

The specimen is *Canavallia obtusifolia,* a bean fairly common in Queensland, New Guinea, and the islands of the Pacific. We were very interested in your remarks about its edible qualities, for a friend of ours in the New Hebrides has recently given us the same report. In Queensland we had always looked upon the bean as harmful, though nobody so far as we know had actually tested it. Two species of the same genus are in cultivation, namely *C. gladiata,* the Sword Bean, and *C. ensiformis,* the Jack Bean. This latter is quite a good bean and we think it would be a valuable addition to the vegetables grown in Papua if you have not already got it.

Hexham Scent. Buck Wheat.

R.D. (Purga, via Ipswich)—

The specimen of lucerne-like plant is *Melilotus parviflora,* the Melilot or Hexham Scent, a fairly common weed in Queensland and the Southern States. It was boomed some time ago as a fodder under the name of King Island Melilot, and has a value for growing in light soils where lucerne may not thrive. It is only of annual duration and dies out on the approach of the hot weather.

The other plant with triangular leaves is *Polygonum convolvulus,* the climbing Buck Wheat. It is now and again seen as a weed in Queensland, but is not particularly common. The seeds are a common ingredient of bird seed and chick food.

BUTTER FACTORY PAYMENTS.

A survey of the audited balance-sheets of Co-operative Dairy Associations in Queensland over the financial year 1929-30 indicates that no considerable difference exists in the payments made by the several Associations for their cream supplies.

The following table indicates the average pay by these Associations, and, taking 1s. 3d. per lb. of commercial butter to be the mean average, the amount over or below this figure indicates how closely factories have kept to this average.

In cases where suppliers receive benefits in dividends, deferred pays, or railway freights, such particulars are shown—

Average Pay.	Above or below 1/3.	Carriage of Cream.
A. 1/4·07 and dividend	+ 1·07	Not paid.
B. 1/3·68	+ 0·68	Railway freight paid.
C. 1/3·54, bonus and dividend	+ 0·54	Not paid.
D. 1/3·53	+ 0·53	Not paid.
E. 1/3·44 and dividend	+ 0·44	Not paid.
F. 1/3·34, deferred pay and bonus	+ 0·33	Not paid.
G. 1/3·24 and dividend	+ 0·24	Not paid.
H. 1/3·04	+ 0·04	Not paid.
I. 1/3·01	+ 0·01	Railway freight paid.
J. 1/2·88 and dividend	— 0·12	All paid.
K. 1/2·76, deferred pay and dividend	— 0.24	Not paid.
L. 1/2·62 and dividend	— 0·38	Not paid.
M. 1/2·55 and dividend	— 0·45	All paid.
N. 1/2·44 and bonus	— 0·56	All paid.
O. 1/2·42 and dividend	— 0·58	All paid.
P. 1/2·39 and dividend	— 0·61	All paid.
Q. 1/2·25	— 0·75	All paid.

The above rates of pay may be influenced by several factors which must be taken into consideration by the dairy farmer. The following factors are illustrative of the point:—

(*a*) Payment of a dividend, bonus, or deferred pay is equivalent to an increase in the rate of pay.

(*b*) Payment for the carriage of cream by rail or road likewise is equivalent to an increase in rate of pay.

(*c*) Upon the situation of a factory depends the marketing costs to a great extent.

(*d*) The amount of butter manufactured affects the rate of pay. Large supplies reduce the rate of overhead expenses.

(*e*) Erection of new buildings and plant temporarily absorbs money, which would otherwise be available for cream pay, although the increased efficiency resulting from modern buildings and plant soon repays the dairy farmer for his investment.

(*f*) The quality of the cream supply plays an important part in the price question, for on it depends the quality of the butter and the amount received for the sale of such butter.

Consideration of the above factors will, to a great extent, explain the differences that exist in factory payments.

General Notes.

Staff Changes and Appointments.

Mr. S. M. Seamer, Inspector of Stock and Slaughter-houses, has been transferred from Cloncurry to Mount Isa as from the 1st November, 1930.

Mr. S. M. Seamer, Inspector of Stock, has been appointed also an Inspector of Slaughter-houses as from 1st November, 1930.

Mr. N. A. R. Pollock, Senior Instructor in Agriculture, Brisbane, has been transferred to Townsville as from the 13th October, 1930.

Mr. D. H. Robertson, of Albinia Downs, Springsure, has been appointed a member of the Leichhardt South Dingo Board.

The appointment of Mr. F. H. S. Roberts as Entomologist, Department of Agriculture and Stock, Brisbane, has been confirmed as from the 23rd January, 1930.

Police Constable P. J. Hotham has been appointed an Inspector under "*The Slaughtering Act of* 1898," at Imbil.

Animal and Bird Sanctuaries.

The new University site, situated on the Brisbane River at St. Lucia, and another property belonging to the University and situated on the main Moggill road, near the confluence of Moggill Creek and the Brisbane River, and containing respectively 223 acres and 693 acres, have been declared sanctuaries under "*The Animals and Birds Acts,* 1921 *to* 1924," in which it shall be unlawful for any person to take or kill any animal or bird. Messrs J. Pacey and B. Baker have been appointed Honorary Rangers for the lastmentioned sanctuary, as from the 8th November, 1930.

Proposed Egg Board.

The first egg pool was created in 1923 and it applied to all owners of 100 fowls or more in that part of Queensland east of a straight line drawn from Bundaberg to Goondiwindi. The pool was extended from time to time, and after a referendum of all those concerned it was in 1926 made to apply to owners of fifty fowls or over, instead of 100. This pool still exists, and expires in 1933, but, with the consent of a majority of producers it may, of course, be further extended after that date. The promoters of the pool, however, asked that it should be made applicable to all producers of eggs for sale irrespective of the number of fowls they own. This suggestion was not approved, and subsequently a deputation of poultrymen waited upon the Minister and urged that all poultrymen selling eggs from twenty fowls or over be brought under the pool.

A petition signed by about 190 growers of eggs was handed in asking that the pool be made applicable to all poultrymen selling eggs from twenty fowls or over. A notice of intention to create such a pool was issued on the 21st August, 1930, but later on the proposal was dropped. The question has been again raised, and as a result the Governor in Council has now approved of the issue of a notice of intention to make an Order in Council creating an egg pool to apply to poultrymen selling eggs from 20 fowls or over, this pool to be constituted on the following basis:—

1. All eggs produced for sale by poultrymen with 20 fowls or over within that area to the east of a straight line from Bundaberg to Goondiwindi to come under the pool.
2. Eggs required for the grower's family for food or for his own use for breeding to be exempt from the pool.
3. The board to be five poultrymen's representatives and the Director of Marketing or a deputy appointed by the Minister.
4. All eggs for sale produced by owners of 20 fowls and over to become the property of the board.
5. The pool will be for a period of ten years.
6. At the referendum to decide whether the pool shall be created a vote to be given to all who will come under it.
7. All poultry raisers selling eggs are to be registered.
8. Any merchant who deals in eggs except with the approval of the pool shall commit an offence.
9. The board may levy ½d. per dozen on eggs delivered to it or to its agents.

10. The board is also empowered to make a levy of ½d. per dozen under each of the following headings:—
    - (a) For establishing an insurance fund against fire or other casualty;
    - (b) For establishing a reserve;
    - (c) For establishing a fund for any special object which may be in the common interests of poultry raisers.
11. All assets and liabilities of the existing pool to be transferred to the new pool.
12. A petition for a referendum may be handed in.
13. If a referendum is conducted a 60 per cent. majority will create the pool, and every poultryman who will come under the pool will be entitled to vote; in other words, the egg producers directly concerned will decide the issue.
14. If no petition is received the pool will be automatically established.
15. If the pool is rejected at the referendum, the old or existing pool will continue to function until the 31st December, 1933, just as if this new pool had never been mooted.

Any petition for a poll to decide whether the Order in Council creating an egg pool as above shall be made must be signed by at least fifty growers of eggs, and must reach the Minister on or before 5 p.m. on the 9th December, 1930. The term egg producers will cover—

(a) Any person owning 20 or more domesticated fowls, i.e., domesticated hens with or without the males and/or the young thereof;

(b) Any person keeping 20 or more domesticated fowls;

(c) Each member of any partnership which keeps 20 or more domesticated fowls, provided that each partnership shall have only one vote between them;

(d) Each member of any family which collectively owns or keeps 20 or more domesticated fowls, provided that each family shall have only one vote between them.

In order to ensure their names being on the roll of persons eligible to vote on any matters in connection with the proposed egg board, persons who are producers are invited to send their names and addresses at once to the Under Secretary, Department of Agriculture and Stock, Brisbane.

Nominations will be received by the Returning Officer, Department of Agriculture and Stock, Brisbane, until 5 p.m. on the 9th December 1930, for election as producers' representatives on the proposed egg board.

Five representatives are to be elected by producers who, at any time in the last twelve months, produced eggs for sale in the following districts in the State of Queensland. One representative is to be elected for each:—

No. 1 District.—Such portions of the Petty Sessions Districts of Bundaberg, Gin Gin, Mount Perry, Eidsvold, Childers, Maryborough, Biggenden, Gayndah, Gympie, Kilkivan, Wienholt, Nanango, Maroochy, Caboolture, Woodford, and Kilcoy as are east of a line drawn from Bundaberg to Goondiwindi.

No. 2 District.—The Petty Sessions Districts of Redcliffe and that portion of Brisbane north of the Brisbane River.

No. 3 District.—The Petty Sessions Districts of Wynnum, Cleveland, and that portion of Brisbane south of the Brisbane River.

No. 4 District.—The Petty Sessions Districts of Logan, Southport, Beaudesert, Goodna, Ipswich, Lowood, Esk, Marburg, Harrisville, Dugandan, Rosewood, Laidley, Gatton, Helidon, and Toogoolawah.

No. 5 District.—Such portions of the Petty Sessions Districts of Toowoomba, Clifton, Pittsworth, Allora, Warwick, Killarney, Inglewood, Texas, Goondiwindi, Stanthorpe, Highfields, Crow's Nest, Oakey, Goombungee, Cooyar, Jondaryan, Cecil Plains, and Dalby as are east of a straight line from Bundaberg to Goondiwindi.

Each nomination is to be signed by at least ten (10) producers in the district concerned. The elected representatives will hold office for a period of one year as from the date of appointment.

Arrowroot Board Levy.

In 1924, an Order in Council was passed empowering the Arrowroot Board to make a levy on arrowroot-growers at the rate of 4d. per ton for the administrative expenses of the Board. This levy has been found to be insufficient for the purpose, and accordingly an Order in Council has now been passed increasing the levy to 6d. per ton.

Banana Weevil Borer—Investigation Committee.

By a regulation issued under the Fruit Marketing Organisation Acts on the 21st April, 1927, provision was made for the formation of a Committee of Investigation to inquire into the claims in connection with the reward of £2,500 for an effective scheme of treatment for the control of the banana weevil borer. The Committee of Direction of Fruit Marketing made application for an alteration of the personnel of the Committee, and the present Committee will therefore comprise Professor E. J. Goddard, Messrs. R. Veitch, J. A. Weddell, K. R. Heck, A. E. Maher, and W. Ranger.

Notice to Buyers of Fertilisers.

Farmers and other buyers would be well advised not to accept delivery of any material unless it has affixed to every package a plainly printed label setting out the percentages of nitrogen, phosphoric acid, and potash. and the forms in which they respectively occur. The buyer should also receive an invoice certificate setting out the particulars that should appear on the labels. Such certificate is the seller's guarantee as to the quality of the material. In the absence of such label and invoice certificate, it is obvious that the buyer should at once communicate with the Department of Agriculture, William street, Brisbane. Buyers are urged to examine all goods on the day of delivery, and when in doubt regarding any fertilisers, seeds, stock foods, or pest destroyers, to write at once to the Department of Agriculture, Brisbane, in order that the matter may be immediately investigated.

Christmas Gifts.

The time-worn question of what to give for a Christmas present is solved by the display of seasonal goods at Pike Brothers.

Presents from Pike Brothers are always acceptable, whether the cost be considerable or modest. It will be wise to shop early and have the advantage of being able to make a selection from a wide range, especially from among several exclusive lines that are of very limited stock. There are several unique, new styles of watches, rare and exquisite perfumes, charming lingerie, silk ties, leather goods, pipes, and other suitable gifts, all well worth a thought when planning Christmas surprises.

Central Cane Prices Board.

The Central Sugar Cane Prices Board has been constituted for a period of three years as from the 13th November, 1930, to consist of the following members:—

His Honour Mr. Justice William Flood Webb (Chairman),
Thomas Alfred Powell (Canegrowers' Representative),
Ernest Stanley Smith (Millowners' Representative),
John McClew MacGibbon (Qualified Sugar Chemist), and
Alexander Robert Henry (Secretary).

Highly Efficient Canecutters Earn their Money.

A vigorous defence of the Queensland canecutter was made by Mr. W. J. Riordan (A.W.U.) when giving evidence before the Commonwealth Committee of Inquiry into the sugar industry. These men, said Mr. Riordan, particularly the young Australians and North Queenslanders, were doing work which demanded highly scientific skill, and those theorists who had written books on fatigue had nothing on these virile cutters. It was very seldom that an old man was found in the cutting gangs. The fastest man was selected to make the pace in the field, and a slow man did not last very long. He was quickly dropped. A visitor to the camps could see them being rubbed with embrocation, and even when engaged in cutting they rested for brief periods if they felt that the strenuous work was likely to impair their efficiency. "So far as I am concerned," remarked Mr. Dutton, a member of the committee, "the cutters earn their money."

Barley Board—Skinless Barley Exemption.

A notice was published in the "Government Gazette" recently to the effect that skinless barley had been exempted from the operations of the Barley Board. In drawing attention to this notice it was stated that, accordingly, the Board's operations would, in future, apply only to malting barley. This statement was obviously incorrect, as the Board will, in future, apply to all barley produced in Queensland, including malting and Cape barley, but with the sole exception of skinless barley.

Introduction of Apples and Pears to Warwick-Stanthorpe District.

On the 21st August, 1930, a Proclamation was issued in which it was declared that all fruit of both apples and pears consigned to any railway station between Wallangarra and Warwick, both inclusive, must be accompanied by a certificate signed by an inspector setting forth that the fruit had been examined and found to be free from the disease "Black Spot," and that such consignments must previously be brought to the picking-over shed, Brisbane, and repacked there under the supervision of an inspector before a certificate would be issued. However, it was found that the Proclamation did not have the desired effect, as fruit merchants adopted the practice of consigning their fruit by rail to Mill Hill, and then to Warwick and other stations per motor truck. Therefore a new Proclamation has been issued, rescinding the former one, which declares that all apples and pears shall be permitted to be introduced into that part of the State comprising the petty sessions districts of Stanthorpe, Warwick, Killarney, Allora, and Clifton, only on condition that the fruit is accompanied by a certificate signed by an inspector stating that the fruit has been examined and found to be free from "Black Spot," and that consignments thereof from Brisbane to any place abovementioned were previously brought to the picking-over shed, Brisbane, and repacked there under the supervision of an inspector before the certificate was issued. This will obviate the difficulty at present experienced, as the conditions will apply to all fruit of apples and pears introduced into the Warwick-Stanthorpe district by rail or road.

Fur-Bearing Rabbits—Amendment of Regulations.

Regulations were issued under the Animals and Birds Acts of this State on the 23rd January, 1930, providing for the licensing of Angora, Chinchilla, or any approved fur-bearing rabbits. Provision was made for the taking of all possible precautions for the safe maintenance of these rabbits in enclosures built in accordance with certain plans and specifications.

The Angora is imported in greater numbers into this State, but the Chinchilla rabbits have been secured by a few rabbit fanciers. The Angora is purely a wool rabbit, and is such a delicate animal that no danger is to be apprehended even if the animal managed to escape from an enclosure, as it would quickly die or be destroyed by cats or dogs. On the other hand, Queensland is still hampered somewhat by lack of experience of the habits of the Chinchilla, and a difference of opinion still exists as to whether this type of rabbit is a burrower, although the evidence available tends to indicate that he does burrow. Consequently, it has been thought desirable to postpone the issue of further licenses for the maintenance of the Chinchilla and other fur-bearing rabbits, and it has been declared that no one shall be granted a license under the regulations, as they are now amended, to keep Chinchilla rabbits unless he holds a license to keep such rabbits in respect of the year 1930 or some part thereof.

Briefly, Angora rabbits may still be introduced. No more Chinchilla or other fur-bearing rabbits may be introduced, but those persons who have these rabbits now in Queensland may continue to keep them, but they will not be allowed to dispose of any of the progeny to anybody else. Chinchilla rabbits now on order overseas can be delivered in Queensland to registered dealers on the understanding that they only go to persons who at present keep Chinchillas.

The Romantic North.

Port Douglas beach, in North Queensland, according to the Minister for Mines (Mr. E. A. Atherton), is an enchanting place. In the Legislative Assembly recently, discussing the vote for the Intelligence and Tourist Bureau, he said that couples went motoring on that beach, where they became so enamoured of one another that they stopped the car. In the course of time the tide rose, isolating them from the mainland, and they were forced to remain there till the waters subsided. He advised every one who has not been there to visit North Queensland.

Travelling Schools.

The Queensland travelling manual training and domestic science schools are in operation for the especial benefit of primary school pupils and adults living in places remote from rural schools or technical colleges. These schools provide a short, continuous, intensive course of instruction, and the facilities for training thus provided are highly appreciated by the people of the far north and west. During the year the schools Nos. 1 and 4 travelled as far west as Cunnamulla, 604 miles from Brisbane; the schools Nos. 2 and 3 conducted courses at Ravenswood and at places north of Townsville and including the Atherton Tableland.

General Farm Layout.

In considering the lines upon which a dairy farm should be laid out, there are a few general principles that should be kept in view in all cases. These may be stated as follows:—

1. Easy access to all parts of the farm.

2. Efficient and economical handling of stock and performance of all farm operations.

3. Good drainage.

4. Aspect—protection from weather and openness to sunlight.

5. Economy of working.

6. Safeguarding the contents of separator and cream store-room from contamination from dust and bad smells.

What is its Capacity ?—How to Measure a Sheep-dipping Bath.

For the safe and effective dipping of sheep, the dipping powder or liquid must be used at exactly the strength prescribed, and to this end it is necessary that the liquid capacity of the bath be accurately gauged. The following method of measuring is recommended in a bulletin of the Stock Branch of the New South Wales Department of Agriculture:—

1. Take the length of the top, add the length of the bottom, and divide by 2. This gives the average length.
2. Take the width of the top, add the width of the bottom, and divide by 2. This gives the average width.
3. Multiply the average length by the average width by the depth to obtain the cubical contents.
4. As 1 cubic foot equals $6\frac{1}{4}$ gallons, the capacity of the dip in gallons is obtainable by multiplying the cubical contents by $6\frac{1}{4}$.

As an example of the method of calculation, take a dip 42 feet long on the top, 17 feet long on the bottom, 6 feet deep, 2 feet wide across the top, and 10 inches wide on the bottom. The figures would be as follows:—

$$\frac{42 + 17}{2} = \frac{59}{2} \text{ feet.}$$

$$\frac{2 \text{ ft.} + 10 \text{ in.}}{2} = \frac{2 \text{ ft. } 10 \text{ in.}}{2} = 1 \text{ ft. } 5 \text{ in.} = \frac{17}{12} \text{ feet.}$$

$$\frac{59}{2} \times \frac{17}{12} \times \frac{6}{1} = \frac{1003}{4} \text{ cubic feet.}$$

$$\frac{1003}{4} \times 6\tfrac{1}{4} = \frac{1003}{4} \times \frac{25}{4} = \frac{25075}{16} = 1{,}567\tfrac{3}{16} \text{ gallons.}$$

In ascertaining the amount of fluid in the bath, measure from the surface of the water. The dip will never be filled right to the top and therefore a measuring stick should be used to obtain a depth, or the measurements marked on the side of the dip.

Another way of ascertaining the capacity of the dipping bath is to measure water into it from a tank of known capacity. First run into the bath, say 3 feet of water and keep a record of the number of gallons required to do this by marking same permanently on the side of the bath. Now continue to add water in 100-gallon quantities, and mark each of these 100-gallon levels on the side of the bath up to 6 inches from the top. A rod may be marked in a similar way, in which case it is advisable to have several rods in case one gets lost.

The Home and the Garden.

OUR BABIES.

Under this heading a series of short articles by the Medical and Nursing Staff of the Queensland Baby Clinics, dealing with the welfare and care of babies, has been planned in the hope of maintaining their health, increasing their happiness, and decreasing the number of avoidable cases of infant mortality.

CARE OF BABIES IN HOT WEATHER.

As the weather grows warmer babies need less clothing. In some parts of Queensland the weather is changeable at this season, and the baby's clothing should be regulated by the temperature, not by the calendar. Over-clothing causes sweating, and may lead to irritation and inflammation of the skin. Waterproof coverings over wet napkins are very likely to do this, and they should not be used. When it becomes really hot, the baby will be happier if he wears little or nothing besides a napkin and singlet with all his limbs free, but protected by mosquito-netting against flies and mosquitoes. He enjoys kicking his legs and waving his arms freely, and this is one of the advantages Queensland babies have.

In hot weather babies need rather less food but more water. Let them have water to drink between their feeds. A baby may be thirsty without being hungry, and if you try to satisfy his thirst with milk, which is a food, you may upset him. Be careful in increasing his diet at this season. If he is being fed on cow's milk this should be clean and fresh. As soon as possible after delivery put the milk in a small saucepan, which should be used for this purpose only, and bring it to the boiling point. Unless the milk has been properly pasteurised by a trustworthy process, this should always be done. Freshly boiled or pasteurised milk will keep quite fresh in an icebox for twenty-four hours, but without ice it cannot be expected to keep fresh for more than twelve hours. An icebox can be made of a kerosene tin placed in a box with 3 or 4 inches of dry sawdust all round, and covered by a lid.

Diarrhoea.

Babies who are being artificially fed very easily get diarrhœa in hot weather. It may be caused by overfeeding, by unsuitable food, or by milk which is stale or dirty. If an artificially fed baby begins to have loose motions, all his food and all his milk should be stopped. He should be given one dose of castor oil to clear out any undigested food, and after that he should have nothing but thin barley water slightly sweetened for twenty-four hours. If then he is not quite well you should get medical advice or take him to the nearest Baby Clinic.

Gastro-Enteritis or Dysentery.

This is a serious disease which may begin gradually with loose motions, but sometimes comes on suddenly with fever and much weakness and irritability. The motions may be simply loose at first, but after a time they are seen to contain slime tinged with blood, may be very frequent and attended by much straining. Next month there will be many cases of this disease in Queensland, and some of these babies will die, for this has been so every year. If all our mothers understood how the disease is caused, and why it spreads from house to house, there would be much less dysentery and very few deaths from this cause among our babies.

Dysentery is not caused by the heat. Usually the worst of the epidemic is over before the hottest weather begins, though sometimes it continues right through the summer. Dysentery is not caused by feeding babies on cow's milk, for all disease germs in the milk are killed by boiling or pasteurising. But it is much more common among bottle-fed babies, whatever food they are getting, than among babies on the breast. The disease is caused by dysentery bacilli, and these disease germs are conveyed by flies from closet-pans or other filth to the babies' food. Not only must the food be most carefully protected from flies, but so must the bottles and teats after they have been scalded. Even breast-fed babies are not safe if they have dummies pinned on to their frocks to invite the disease-bearing flies to settle on them.

Protect your baby against this enfeebling, painful, dangerous, and often fatal disease by natural feeding, by avoiding the dangerous dummy, and by carefully protecting its artificial food from infection by flies.

Barley-water.

To make barley-water, take one tablespoonful of pearl barley, wash it carefully, add to 1 pint of water, and simmer for one hour. Then make up to 1 pint from the kettle, and strain carefully. Prepare fresh twice daily.

CONSTIPATION IN BABIES.

Breast-fed babies are never really constipated. Their motions are always soft, though they may be passed at long and irregular intervals. This sluggishness of the bowels arises from two causes—(1) Giving castor oil to the baby; (2) want of proper training.

Castor Oil Not Necessary for the Newborn Baby.

The first effect of castor oil is to empty the bowels. Its second effect is to prevent them from acting. The harmful and unnecessary practice of giving castor oil to a newborn baby starts an irregularity which is kept up and increased by repeated doses of castor oil. There results a condition artificially manufactured by the mother or nurse, which she calls "constipation."

Once or twice a day the baby should be allowed to lie without his clothes, or with only a singlet, and exercise his legs and abdominal muscles by freely kicking, for fifteen or twenty minutes in warm weather. This will often induce a motion. If necessary he must be held out over a pan, just touching its rim. It is a good plan to hold out a baby after each feed. He will pass water, thus keeping his napkin dry, and will often pass a motion. If the baby's training has been long neglected, these methods may not suffice. It may then be necessary to pass a soap pencil dipped in oil, or inject a few teaspoonfuls of plain boiled water into the bowel. Gently kneading the abdomen, beginning low on the right side, upwards to the ribs, across, and down on the left side, should help. Medicines should not be necessary.

Bottle-fed Babies.

Bottle-fed babies suffer from the same mismanagement and need the same treatment. With them the condition is more troublesome, for cow's milk is often constipating and causes firmer motions, often in solid masses, and sometimes in small round lumps like pebbles. The food may need adjusting, and it would be wise to consult a clinic nurse if possible. See that the baby drinks enough water. He may be taking more milk, especially if this is dried milk, than he should. The substitution of malt-sugar in the form of Mellin's Food, Maltogen, or Extract of Malt, for some or all of the sugar in his food, is often helpful, so is prune juice given as a medicine. If drugs are necessary, fluid magnesia, milk of magnesia, and liquid petroleum oil may be given in teaspoonful doses once or twice a day. No other medicines should be given except on medical advice.

A Very Important Point.

This is very important. Whatever medicines are given for constipation, much depends on the way the medicine is given. If too large a dose is given, or if it is given every second or third day, or once or twice a week, the irregularity of the bowels is increased, and the constipation may become permanent. The medicine should be given every day at the same time, in just sufficient doses to produce its effect and no more. The dose must be determined by trial. Once a daily regular action has been established, the dose should be slowly made less, and after a time may be left off. Used rightly, the medicine will help to cure constipation; used wrongly, the same medicine will make it worse.

THREADWORMS.

Children with threadworms generally suffer from an itchiness at the seat especially at bedtime. This may make them restless and prevent them from going to sleep. The itchiness is caused by the worms coming out of the anus and crawling about. More serious symptoms from threadworms are extremely rare in Queensland. "Picking at the nose" is not a sign of worms.

The only way to be sure that a child has threadworms is to see them in the motions. This is not difficult. They are about the size of cotton thread, about half an inch long, and are probably alive and wriggle. All sorts of things in the motions, for instance the stringy parts of bananas, are sometimes mistaken by mothers for worms. If you are in doubt, put the things into a small bottle with methylated spirits and show them to your doctor. Children should not be given medicines for worms that they have not got.

Causes.

Every threadworm grows from an egg which has been swallowed. These eggs are very small and can be seen only with a microscope. The young child swallows some of these eggs accidentally, perhaps from the fingers of another child. When the worms crawl out to lay their eggs and so cause itchiness, he crushes them with his fingers, which become covered with these invisible eggs. Even though the hands are washed clean, there remain many eggs under the finger nails. All young children put their fingers into their mouths at times, and so they are continually reinfecting themselves, and increasing the number of their worms. Older children who suffer from worms will be found nearly always to have the habit of biting their nails.

Treatment.

If the worms are numerous, medical treatment will give relief. Strong medicines are necessary, and as these may be dangerous, they should be given only under medical direction. Injections of strong salt and water (as much salt as the water will dissolve) given after the bowel has been emptied will often bring away many worms, and these injections are harmless. Though many worms may be brought away by medical treatment, there are nearly always a few left behind. From these the child will probably reinfect himself, and in a few months may have as many as before.

The real cure of threadworms depends on the mother. Make the child sleep in good thick "combinations," so that his fingers cannot get at the worms to crush them. Smear some vaseline around the anus before he goes to bed to prevent the worms crawling and causing itching, or ask your doctor for some ointment which will kill the worms when they come out. If reinfection is prevented, the few worms left will die out of themselves.

VEGETABLES.

Vegetables will require constant attention next month, particularly in the Granite Belt area. Tomatoes and potatoes should be carefully watched in order to prevent loss from Irish blight, and no time should be lost in spraying these crops should this disease make its appearance in any part of the district, as it can be prevented by spraying with either Bordeaux or Burgundy mixture. These fungicides effectually protect the plants to which they are applied if used in time. If leaf-eating insects, such as beetles, grasshoppers, and caterpillars, are doing damage as well, add 3 or 4 lb. of arsenate of lead to the 100 gallons of spraying mixture used for the prevention of early and late blight (potato macrosporium and Irish blight), so that the one application will be effectual for both classes of diseases.

Keep all kinds of vegetables well worked, stirring the land frequently to retain moisture, and taking care to prevent the formation of a surface crust should rain fall. Remember that vegetables require plenty of moisture; therefore leave nothing to chance, but do your best to retain all the moisture in the soil you possibly can.

FLOWER GARDEN.

To make the flower-beds gay and attractive during the autumn and winter months is not a matter of great difficulty. Prepare a few shallow boxes. Make a compost, a great part of which should consist of rotten leaves. Fill the boxes with the compost; then sow thinly the seeds of annuals. Keep the surface of the soil moist, and when the young seedlings are large enough to handle, lift them gently one by one with a knife or a zinc label—*never pull them up by hand*, as, by so doing, the tender rootlets are broken, and little soil will adhere to the roots. Then prick them out into beds or boxes of very light soil containing plenty of leaf mould. Keep a sharp lookout for slugs and caterpillars.

All kinds of shrubby plants may be propagated by cuttings. Thus, pelargoniums, crotons, coleus, and many kinds of tropical foliage plants can be obtained from cuttings made this month. After putting out cuttings in a propagating frame, shade them with a piece of calico stretched over it. Be careful not to over-water at this season. Propagate verbenas, not forgetting to include the large scarlet fox hunter. Verbenas require rich soil. Palms may be planted out this month. If the weather prove dry, shade all trees planted out. With seed-boxes, mulch, shade, water, and kerosene spray, all of which imply a certain amount of morning and evening work, the flower garden in autumn and winter will present a charming sight.

KITCHEN GARDEN.

A first sowing of cabbages, cauliflower, and Brussels sprouts may now be made in covered seed beds, which must be well watered and carefully protected from insect pests. Sow in narrow shallow drills; they will thus grow more sturdy, and will be easier to transplant than if they were sown broadcast. The main points to be attended to in this early sowing are shading and watering. Give the beds a good soaking every evening. Mulching and a slight dressing of salt will be found of great benefit. Mulch may consist of stable litter, straw, grass, or dead leaves. Dig over all unoccupied land, and turn under all green refuse, as this forms a valuable manure. Turn over the heavy land, breaking the lumps roughly to improve the texture of the soil by exposure to the sun, wind, and rain. In favourable weather, sow French beans, cress, cauliflower, mustard, cabbage, celery, radish for autumn and winter use. Sow celery in shallow well-drained boxes or in small beds, which must be shaded till the plants are well up. Parsley may be sown in the same manner. Turnips, carrots, peas, and endive may also be sown, as well as a few cucumber, and melon seeds for a late crop. The latter are, however, unlikely to succeed except in very favourable situations. Transplant any cabbages or cauliflowers which may be ready. We do not, however, advise such early planting of these vegetables, because the fly is most troublesome in February. For preference, we should defer sowing until March. Still, as "the early bird catches the worm," it is advisable to try and be first in the field with all vegetables, as prices then rule high. Cucumbers, melons, and marrows will be in full bearing, and all fruit as it ripens should be gathered, whether wanted or not, as the productiveness of the vines is decreased by the ripe fruit being left on them. Gather herbs for drying; also garlic, onions, and eschalots as the tops die down.

CONTROL OF WEEDS—SOME USEFUL MEASURES.

Once some species of weeds become firmly established, eradication is practically impossible; effective control of these is only possible before they have become established. Where weeds have taken possession and landowners realise that cutting is impossible, they look with hope to the use of chemicals as a means of destruction; but the question of cost must be considered, and although chemicals have been found to be effective in destroying weeds, on the whole the cost in such cases is prohibitive.

The old method of destroying plants by hand-hoeing or cultivation still remains as practically the only effective one that can be adopted. Provided the weeds are attacked in time and every care is exercised in cutting out new plants as they appear, weeds can be kept in control by this means at a comparatively low cost. Nevertheless, from various causes, weeds may eventually become so firmly established that other methods must be adopted, and the following suggestions are made so that farmers and graziers may adapt them to their needs in accordance with the severity of the infestation and the means at their disposal.

Destruction by Cultivation.—Certain weeds that are crop pests have roots or underground stems of such a nature that the plant reproduces freely from them, and, as a consequence, these weeds (amongst them are Johnson grass, sorrel, bindweed, &c.) are difficult to control. The most effective means of controlling weeds of this type is to plough the land deeply about September, and to cultivate it in such a way that the soil moisture is dried out. This can usually be done by cultivating the land very deeply with springtooth or rigid tine cultivators.

The object should be to loosen the land as much as possible, and at the same time to bring the roots to the surface. Provided the weather remains dry, this method is fairly effective, and if the weed is not killed entirely it is thinned out to a considerably extent. Obviously, however, the method is only successful when the weather is fairly dry, and it does not give good results in districts with a heavy rainfall.

Smothering Crops.—In conjunction with the cultivation method, smothering crops can be used with excellent results. After cultivating the land thoroughly in the way suggested, a rapid-growing crop such as wheat or oats should be sown. The cultivation of the land puts it in good condition for the crop, and the rapid growth under fairly favourable conditions prevents weed growth and establishes control.

Enforced Germination.—Another method of bringing weeds under control by cultivation is to work the land in such a way that the most favourable conditions are created for the germination of seed, and then to destroy the seedlings. Every farmer knows that when crop seed is being sown the soil must be put into a favourable condition for germination, and if the object is to destroy weeds, similar conditions must prevail.

The time and method of cultivating the soil will depend on the habits of the weed. If the weed is one which grows in the spring the soil workings must be made with the object of having the soil in proper condition at that period, while on the other hand if they are winter-growing seeds the soil must be prepared for favourable germination during the autumn.

Generally the practice should be to plough the land at least a month or two before the period when germination is expected, to allow weathering, and then to work with cultivator and harrows to reduce the soil to a fine tilth. In some cases, especially if the soil is in a loose condition, it may be advisable to use a roller in order to make it firm, as germination always occurs more satisfactorily when the seed is in a firm soil with from 1 inch to 2 inches of loose, fine soil on the surface. The young seedlings are then destroyed by the subsequent cultivations given to preserve the mulch and to prepare the seed-bed for the crop.

For weeds such as saffron thistle, star thistle, and others of a similar character which infest the wheat-growing areas, this is the most effective method, but to control these and other weeds which affect the wheat crop it is necessary to adopt a system of long fallow and to have the land under cultivated fallow for about twelve months.

Orchard Notes for January.

THE COASTAL DISTRICTS.

All orchards, plantations, and vineyards should be kept well cultivated and free from weed growth; in the first place, to conserve the moisture in the soil, so necessary for the proper development of all fruit trees and vines; and, secondly, to have any weed growth well in hand before the regular wet season commences. This advice is especially applicable to citrus orchards, which frequently suffer from lack of moisture at this period of the year if the weather is at all dry, and the young crop of fruit on the trees is injured to a greater or less extent in consequence.

Pineapple plantations must also be kept well worked and free from weeds, as when the harvesting of the main summer crop takes place later on, there is little time to devote to cultivation. If this important work has been neglected, not only does the actual crop of fruit on the plants suffer, but the plants themselves receive a setback.

Banana plantations should be kept well worked, and where the soil is likely to wash badly, or there is a deficiency of humus, a green crop for manuring may be planted. Should the normal wet season set in, it will then soon cover the ground without injury to the banana plants. When necessary, banana plantations should be manured now, using a complete manure rich in potash and nitrogen. Pineapples may also be manured, using a composition rich in potash and nitrogen, but containing no acid phosphate (superphosphate) and only a small percentage of bonemeal, ground phosphatic rock, or other material containing phosphoric acid in a slowly available form.

Bananas and pineapples may still be planted, though it is somewhat late for the former in the more southern parts of the State. Keep a good lookout for pests of all kinds, such as Maori on citrus trees, scale insects of all kinds, all leaf-eating insects, borers, and fungus pests generally, using the remedies recommended in Departmental publications.

Fruit fly should receive special attention, and on no account should infested fruit of any kind be allowed to lie about on the ground to become the means of breeding this serious pest. If this is neglected, when the main mango crop in the South and the early ripening citrus fruits are ready, there will be an army of flies waiting to destroy them.

Be very careful in handling and marketing of all kinds of fruit, as it soon spoils in hot weather, even when given the most careful treatment. Further, as during January there is generally more or less of a glut of fresh fruit, only the best will meet with a ready sale at a satisfactory price.

Grapes are in full season, and in order that they may be sold to advantage they must be very carefully handled, graded, and packed, as their value depends very much on the condition in which they reach the market and open up for sale. Well-coloured fruit, with the bloom on and without a blemish, always sells well, whereas badly coloured, immature, or bruised fruit is hard to quit.

One of the greatest mistakes in marketing grapes is to send the fruit to market before it is properly ripe, and there is no better way to spoil its sale than to try and force it on the general public when it is sour and unfit to eat.

Bananas for sending to the Southern States require to be cut on the green side, but not when they are so immature as to be only partially filled. The fruit must be well filled but show no sign of ripening; it must be carefully graded and packed and the cases marked in accordance with the regulations under the Fruit Cases Acts and forwarded to its destination with as little delay as possible.

Pineapples should be packed when they are fully developed, which means that they contain sufficient sugar to enable the fruit to mature properly. Immature fruit must not be marketed, and if an attempt is made to do so the fruit is liable to seizure and the sender of the fruit to prosecution under the abovenamed regulations. Further, the fruit must be graded to size and the number of fruit contained in a case must be marked thereon. Immature fruit must not be sent. For canning, the fruit should be partly coloured; immature fruit is useless; and overripe fruit is just as bad. The former is deficient in colour and flavour and the latter is "winey" and of poor texture, so that it will not stand the necessary preparation and cooking.

Should there be a glut of bananas, growers are advised to try and convert any thoroughly ripe fruit into banana figs.

The fruit must be thoroughly ripe, so that it will peel easily, and it should be laid in a single layer on wooden trays and placed in the sun to dry. If the weather is settled, there is little trouble, but if there is any sign of rain the trays must be stacked till the weather is again fine, and the top of the stack protected from the rain. To facilitate drying, the fruit may be cut in half lengthways. It should be dried till a small portion rubbed between the finger and thumb shows no sign of moisture. It can be placed in a suitable box to sweat for a few days, after which it can be dipped in boiling water to destroy any moth or insect eggs that may have been laid on it during the process of drying and sweating. It is then placed in the sun to dry off any moisture, and when quite dry it should be at once packed into boxes lined with clean white paper. It must be firmly packed, when, if it has been properly dried, it will keep a considerable time. It can be used in many ways, and forms an excellent substitute for raisins, sultanas, currants, or other dried fruits used in making fruit cakes and other comestibles. Banana figs will be found useful for home consumption, and it is possible that a trade may be built up that will absorb a quantity of fruit that would otherwise go to waste.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

January is a busy month in the Granite Belt, and orchardists are fully occupied gathering, packing, and marketing the crop of midseason fruits, consisting of plums of several kinds, peaches, nectarines, pears, and apples. The majority of these fruits are better keepers and carriers than those that ripen earlier in the season; at the same time, the period of usefulness of any particular fruit is very limited, and it must be marketed and disposed of with as little delay as possible.

With the great increase in production, owing to the large area of new orchards coming into bearing and the increasing yields of those orchards that have not come into full profit, there is not likely to be any market for immature or inferior fruit. There will be ample good fruit to fully supply the markets that are available and accessible. Much of the fruit will not carry far beyond the metropolitan market, but firm-fleshed plums, clingstone peaches, and good firm apples should stand the journey to the Central District, and, if they are very carefully selected, handled in a manner to prevent any bruising, and properly graded and packed, they should carry as far as Townsville. Growers must remember that, given a market fully supplied with fruit, only such fruit as reaches that market in first-class condition is likely to bring a price that will pay them; consequently the grower who takes the trouble to send nothing but perfect fruit, to grade it for size and colour, to pack it carefully and honestly, placing only one-sized fruit, of even quality and even colour, in a case and packing it so that it will carry without bruising, and, when opened up for sale, will show to the best advantage, is pretty certain of making good. On the other hand, the careless grower who sends inferior, badly graded, or badly packed fruit is very likely to find when the returns for the sale of this fruit are to hand that after paying expenses there is little, if anything, left. The expense of marketing the fruit is practically the same in both cases.

Then why "spoil the ship for a ha'p'orth of tar" after you have gone to the expense of pruning, spraying, manuring, and cultivating your orchard? Why not try and get a maximum return for your labour by marketing your fruit properly? The packing of all kinds of fruit is a fairly simple matter, provided you will remember—

(1) That the fruit must be fully developed, but yet quite firm when gathered.

(2) That it must be handled like eggs, as a bruised fruit is a spoilt fruit, and, when packed with sound fruit, spoils them also.

(3) That only one-sized fruit, of an even degree of ripeness and colour, must be packed in a case.

(4) That the fruit must be so packed that it will not shift, for if it is loosely packed it will be so bruised when it reaches its destination that it will be of little value. At the same time, it must not be packed so tightly as to crush the fruit.

If these simple rules are borne in mind, growers will find that much of the blame they frequently attribute to the fruit merchants or middlemen is actually the result of their own lack of care. Fruit that opens up in the pink of condition sells itself, whereas any fruit that opens up indifferently is hard to sell on any except a bare market, and on a glutted market is either unsaleable or realises such a poor price that the grower is frequently out of pocket and would have been better off had he not attempted to market it.

If spraying with arsenate of lead, and systematic bandaging, has been properly carried out, there will be comparatively few codlin moths to destroy the later ripening pip fruits; but if these essential operations have been neglected or carelessly carried out a number of moths will hatch out and the eggs laid by them will turn to larvæ that will do much damage, in some cases even more than that caused by the first broods that attack the fruit as soon as it is formed. Where there is any likelihood, therefore, of a late crop of moths, spraying with arsenate of lead must be continued if the late crop of pip fruits is to be kept free from this serious pest.

Fruit fly must be systematically fought, and on no account must any fly-infected fruit be allowed to lie about on the ground and breed this pest, to do further damage to the later ripening fruits.

Citrus orchards will need to be kept well cultivated in the drier and warmer parts of the State, and, where necessary, the trees should be irrigated. If scale insects are present, the trees should be either sprayed, or, better still, treated with hydrocyanic acid gas.

Western grapes are in full season, and if they are to be sent long distances by rail then they are all the better to be cut some hours before they are packed, as this tends to wilt the stems and keep the berries from falling off in transit. The fruit must be perfectly dry when packed, and should be as cool as possible. It must be firmly packed, as a slack-packed case always carries badly and the fruit opens up in a more or less bruised condition.

Farm Notes for January.

FIELD.—The main business of the field during this month will be ploughing and preparing the land for the potato and other future crops, and keeping all growing crops clean. Great care must be exercised in the selection of seed potatoes to ensure their not being affected by the Irish blight. Never allow weeds to seed. This may be unavoidable in the event of long-continued heavy rains, but every effort should be made to prevent the weeds coming to maturity. A little maize may still be sown for a late crop. Sow sorghum, imphee, Cape barley, vetches, panicum, teosinte, rye, and cowpeas. In some very early localities potatoes may be sown, but there is considerable risk in sowing during this month, and it may be looked upon merely as an experiment. Plant potatoes whole. Early-sown cotton will be in bloom.

On coastal and intercoastal scrub districts, where recently burnt-off scrub lands are ready for the reception of seed of summer-growing grasses, sowing may commence as soon as suitable weather is experienced. Much disappointment may be saved, and subsequent expenditure obviated, by ensuring that only good germinable grass seed is sown, of kinds and in quantities to suit local conditions, the circumstances being kept in mind that a good stand of grass is the principal factor in keeping down weeds and undergrowth.

In all districts where wheat, barley, oats, canary seed, and similar crops have recently been harvested, the practice of breaking up the surface soil on the cropped areas should invariably be adopted. Soil put into fit condition in this way will "trap" moisture and admit of the rains percolating into the subsoil, where the moisture necessary for the production of a succeeding crop can be held, provided attention is given to the maintenance of a surface mulch, and to the removal, by regular cultivation, of volunteer growths of all kinds. If not already seen to, all harvesting machinery should be put under cover, overhauled, and the woodwork painted where required.

Where maize and all summer-growing "hoed" crops are not too far advanced for the purpose, they should be kept in a well-cultivated condition with the horse hoe. Young maize and sorghum crops will derive much benefit by harrowing them, in the same direction as the rows are running, using light lever harrows with the tines set back at an angle to obviate dragging out of plants, but the work should not be done in the heat of the day.

Quick-maturing varieties of maize and sorghum may still be sown in the early part of the month in coastal areas where early frosts are not expected.

Succession sowings may be made of a number of quick-growing summer fodder crops—Sudan grass, Japanese and French millet, white panicum, and liberty millet (panicum). In favourable situations, both "grain" and "saccharine" sorghums may still be sown; also maize, for fodder purposes.

Fodder conservation should be the aim of everyone who derives a living from stock, particularly the dairyman; the present is an important period to plan cropping arrangements. Exclusive of the main crops for feeding-off (when fodder is suitable for this purpose), ample provision should be made for ensilage crops to be conserved in silo or stack. As natural and summer-growing artificial grasses may be expected to lose some of their succulence in autumn, and more of it in winter and early spring, the cropping "lay-out" to provide a continuity of succulent green fodder throughout the season calls for thorough and deep cultivation and the building up of the fertility and moisture-holding capacity of the soil. Planter's friend (sorghum) may be sown as a broadcast crop at the latter end of the month for cutting and feeding to cattle in the autumn and early winter. Strips of land should be prepared also for a succession sowing about the second week in February, and for winter-growing fodder crops.

Plate 196.—Station Homestead, Eurella, *via* Roma.

ASTRONOMICAL DATA FOR QUEENSLAND.

Times Computed by D. EGLINTON, F.R.A.S., and A. C. EGLINTON.

TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

	December, 1930.		January, 1931.		MOONRISE. Dec. 1930.	MOONRISE. Jan. 1931.
Date.	Rises.	Sets.	Rises.	Sets.	Rises.	Rises.
					p.m.	p.m.
1	4.52	6.30	5.3	6.47	1.55	3.38
2	4.52	6.30	5.3	6.47	2.53	4.41
3	4.52	6.31	5.4	6.47	3.51	5.46
4	4.53	6.32	5.4	6.48	4.52	6.49
5	4 53	6.33	5.5	6.48	5.57	7.50
6	4.53	6.34	5.6	6.48	7.0	8.42
7	4.53	6.34	5.6	6.49	8.5	9.24
8	4.53	6.35	5.7	6.49	9·6	10.12
9	4.53	6.35	5.8	6.49	10.1	10.37
10	4.54	6.36	5.9	6.49	10.47	11.9
11	4.54	6.37	5.9	6.49	11.26	11.42
12	4.54	6.38	5.10	6.49	...	...
					a.m.	a.m.
13	4.54	6 38	5.11	6 49	12.1	12.19
14	4.54	6.39	5.12	6.48	12.35	12.53
15	4.54	6.39	5.13	6.48	1.8	1.37
16	4.55	6.40	5.14	6.48	1.40	2.25
17	4.55	6.40	5.15	6 48	2.16	3.19
18	4.56	6.41	5.16	6 48	2.55	4.15
19	4.56	6.41	5.17	6 47	3.40	5.11
20	4.57	6.42	5 17	6.47	4.32	6.7
21	4.57	6.43	5.18	6.47	5.27	7.5
22	4.58	6.43	5.19	6.47	6.23	7.58
23	4 58	6.44	5.20	6.47	7.20	8.50
24	4.59	6.44	5.21	6.47	8.15	9.42
25	4.59	6.45	5.21	6.46	9.12	10.31
26	5 0	6.45	5 22	6.46	10.4	11.26
						p.m.
27	5 0	6 46	5.22	6.46	10.57	12.21
28	5.1	6.46	5.23	6 46	11.49	1.20
29	5.1	6.46	5.24	6.45	12.41	2.22
30	5.2	6.47	5.24	6.45	1.36	3.24
31	5.3	6.47	5.25	6.45	2.34	4.28

Phases of the Moon, Occultations, &c.

6 Dec.	○	Full Moon	10 40 a.m.
13 ,,	☽	Last Quarter	6 7 a.m.
20 ,,	●	New Moon	11 24 a.m.
28 ,,	☾	First Quarter	1 59 p.m.

Perigee, 10th December, at 11.42 a.m.
Apogee, 26th December, at 5.48 a.m.

Mars, having apparently travelled through the constellation Cancer and reached the border of Leo on 28th November, will proceed barely 3 degrees further amongst the stars of the latter constellation until 19th December. It will then seem to come to a standstill and move backward about 5½ degrees into Cancer, until 4th May next year.

Mercury will reach its greatest elevation, 20 degrees above the western horizon, at sunset on the 20th.

Venus will be shining with unusual lustre at Christmas time, reaching its greatest phase on the 28th. It will be apparently amongst the stars of the head of Scorpio.

Mercury will set at 7.34 p.m. on the 1st and at 8.8 p.m. on the 15th.

Venus will rise at 4 a.m. on the 1st and at 3.3 a.m. on the 15th.

Mars will rise at 11.8 p.m. on the 1st and at 10.19 p.m. on the 15th.

Jupiter will rise at 9.29 p.m. on the 1st and at 8.24 p.m. an the 15th.

Saturn will set at 8.49 p.m. on the 1st and at 8.0 p.m. on the 15th.

The Southern Cross, having reached position V. about 6 p.m. on the 1st, will be coming into view in the south-east about 11 p.m. and will reach position IX. about 2 a.m.

4 Jan.	○	Full Moon	11 15 p.m.
11 ,,	☽	Last Quarter	3 9 p.m.
19 ,,	●	New Moon	4 36 a.m.
27 ,,	☾	First Quarter	10 5 a.m.

Perigee, 7th January, at 12.48 a.m.
Apogee, 22nd January, at 11.18 p.m.

The Earth will be at its least distance from the Sun, 91,330,000 miles, on the 3rd.

The Moon will be passing from west to east of Jupiter, early in the morning of the 5th when both are in the north-west and Jupiter 5 degrees to the southward of the Moon.

The Sun will pass from west to east of Saturn on the 5th, about half a degree on its southern side. Saturn will then be on the far side of its orbit, 978,000,000 miles from the Earth, whereas the Sun will be only 91,500,000 miles away.

Mercury will pass from west to east of the Sun on the 6th on the side of its orbit nearest to the Earth; but being 2 degrees to the northward will avoid a transit of the Sun's face, On the 28th it will be at its greatest western elongation, 25 degrees, and rise one hour 52 minutes before the Sun.

On the opposite side of the sky Jupiter, on the 6th, will reach a position in its orbit which brings it nearly to its least distance from the Earth.

For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S., add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhat about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.